

“You’re still on the fastest route. Would you like to proceed?”

Investigating changes in primary health care access in Hawke’s Bay, New Zealand, following Cyclone Gabrielle

Grace Sokolow
April 2024

Public Health



A 2011 protest about health care in New York City. (Photo: Spencer Platt/Getty Images)

From Belluz, Julia. "Why Canadians and Americans Will Never Agree on Health Care." Vox. July 1, 2015. Accessed April 15, 2024

Today!

Public Health



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Today!

Extreme Events



Driveway in Middlebury, Vermont after heavy rain. Grace Sokolow 2023.

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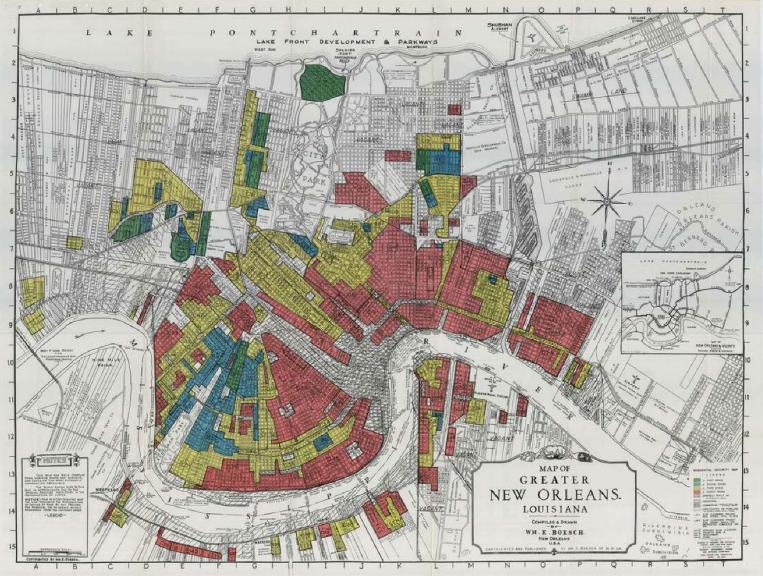
Today!

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Social Geographies



The original HOLC map of New Orleans. (Mapping Inequality). From Domonoske, Camilla.

"Interactive Redlining Zooms in on America's History of Discrimination." NPR. October 2016. Accessed April 16, 2024

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Today!

Computational Methodologies



XKCD.
From Patrizi4, Pinterest. Accessed April 16, 2024



Cyclone Gabrielle

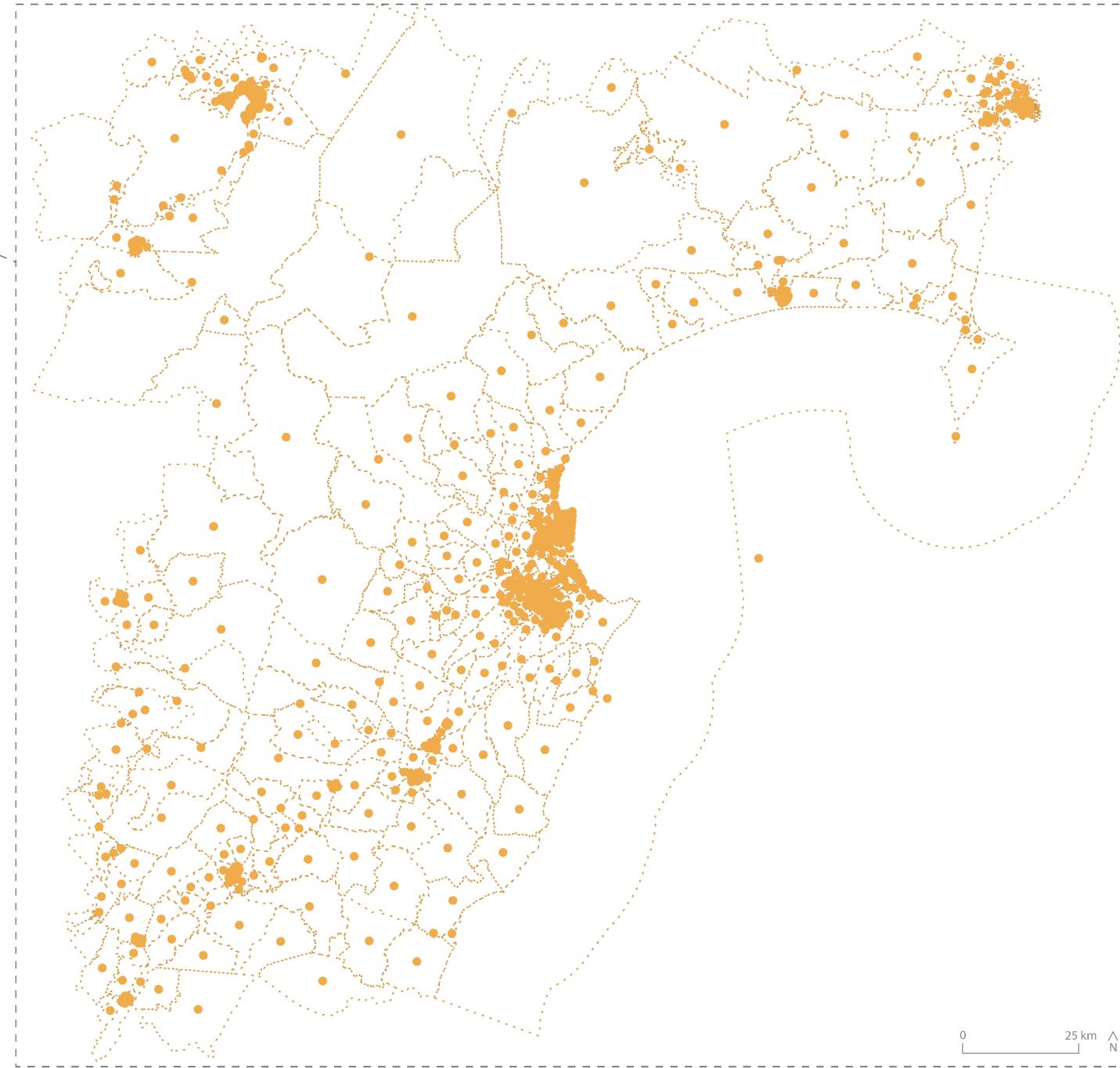
Research questions

1. How did road access to primary health care facilities change before and after Cyclone Gabrielle?
2. What characterizes the communities affected?



Hawke's Bay, New Zealand

Statistical Area 1s

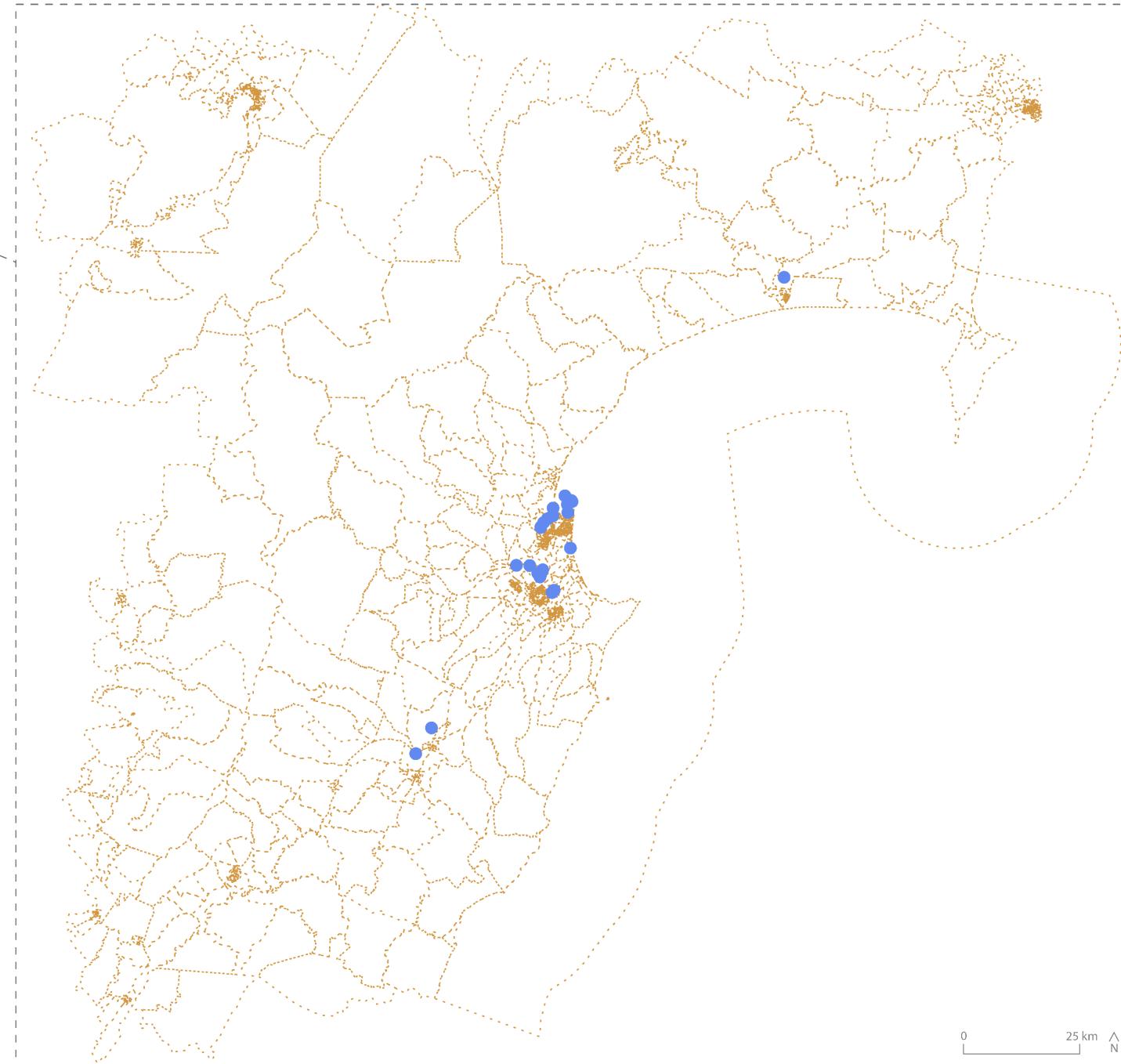


Data Sources: Stats NZ,
Toitū Te Whenua Land Information New Zealand



Hawke's Bay, New Zealand

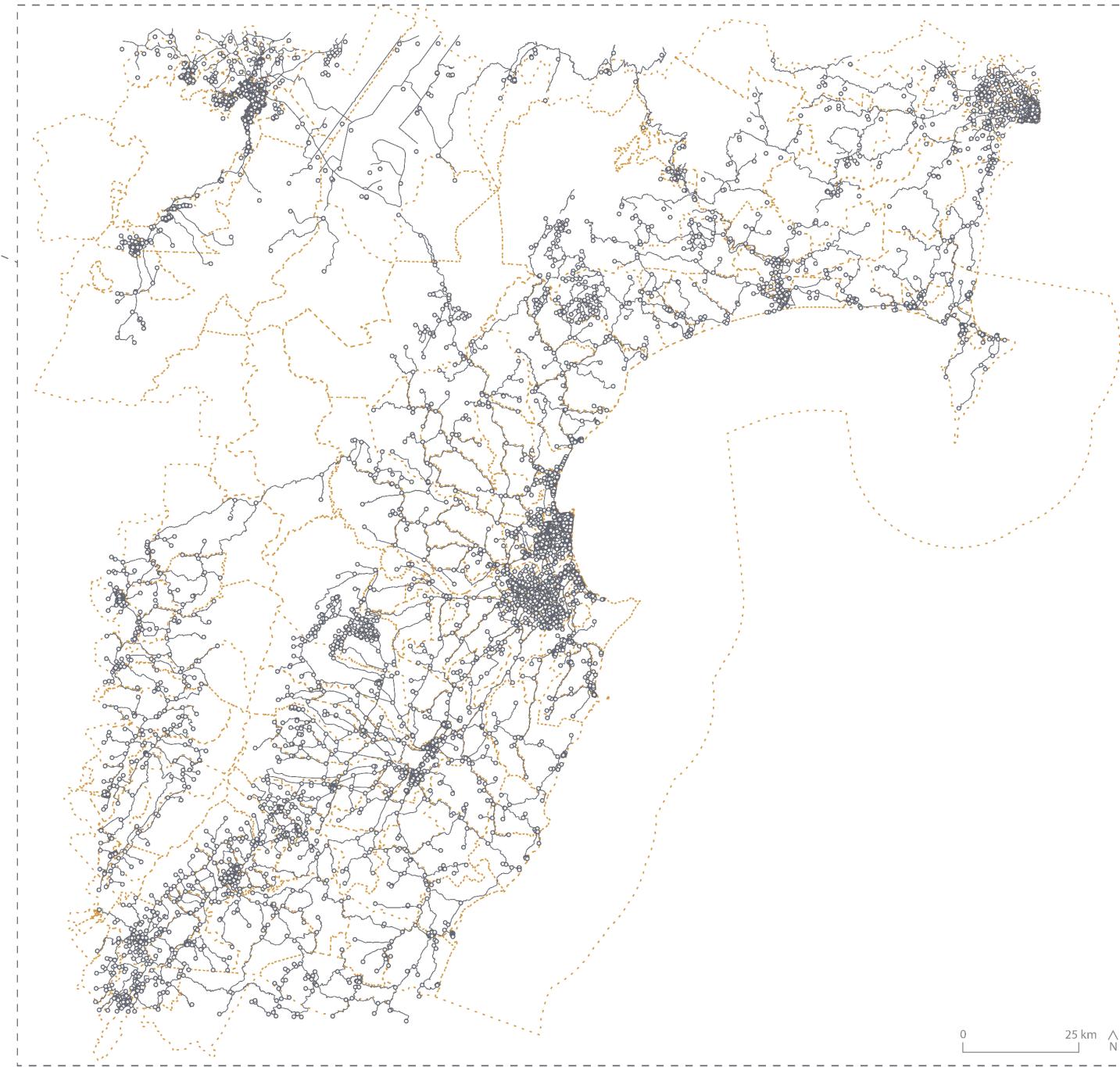
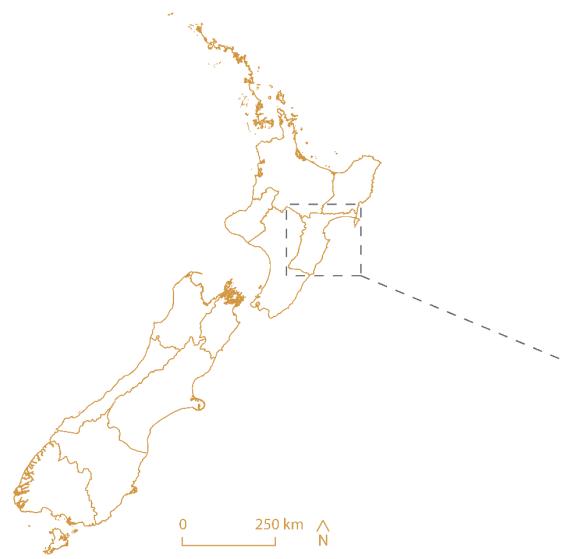
General Practitioners



Data Sources: Stats NZ, Te Oranga o Te Matau-a-Māui Health Hawke's Bay, Toitū Te Whenua Land Information New Zealand

Hawke's Bay, New Zealand

Road Network



Legend

- Road network (edge, node)
- - - Statistical Area Boundary



Data Sources: Stats NZ, Open Street Maps 2
Toitū Te Whenua Land Information New Zealand



Napier City Council - Te Kaunihera
o Ahuriri

February 16, 2023 ·

!! Napier roading update !!

The following roads in Napier are closed, please take alternate routes:

- Convent Road
- Spencer Road- Lawrence Road to Hospital Terrace (scheduled)
- Awatoto Road - Waitangi Road to Brookfields Road/Sandy Road intersection
- Lister Crescent /Geddis Avenue
- Seaview Terrace
- Poraiti Road
- Dunlop Road
- Waverley Road
- Essex Street
- Brookfield Road / Sandy Road
- Awatoto Road – Te Awa Avenue to Meeanee Road
- Awatoto Road - Waitangi Road to Brookfields Road/Sandy Road intersection
- Springfield Road and Puketapu Road

Please only travel if it is essential. Drive to the conditions, and stay safe. See less



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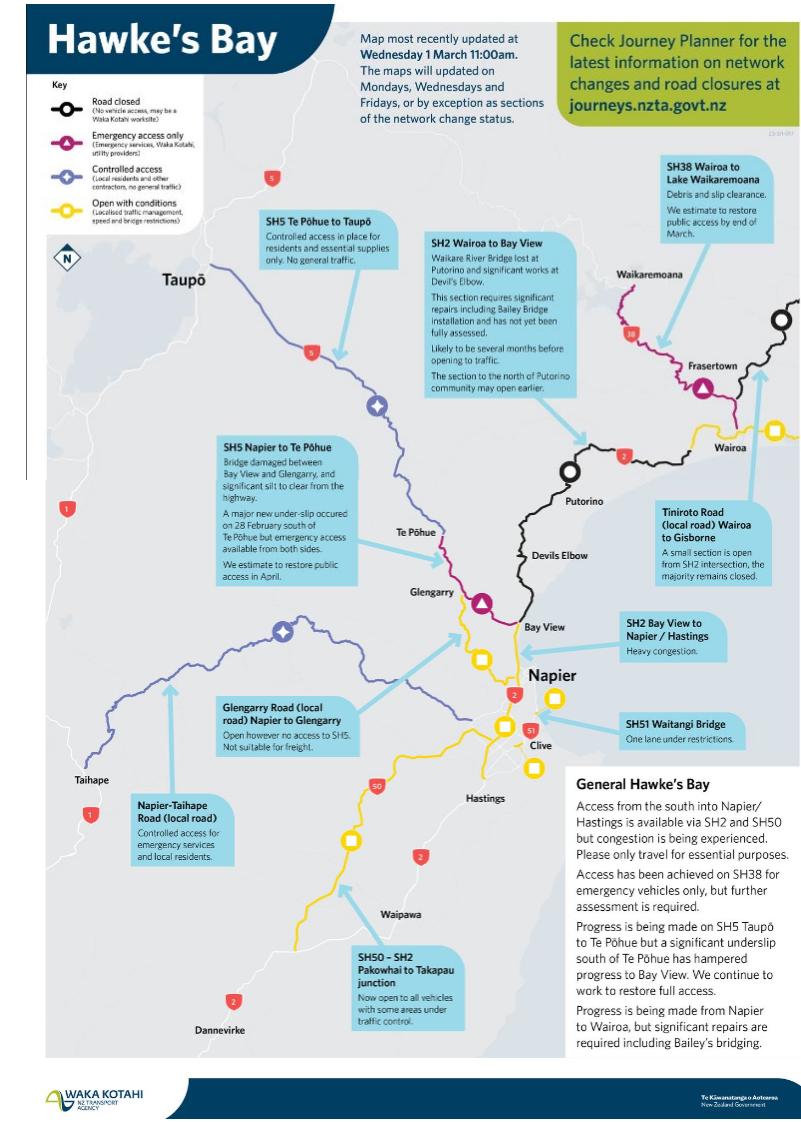
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Roads and air

- 👉 SH2 Gisborne to Ōpōtiki opens 7am – 7pm from Saturday.
- 👉 SH2 Gisborne to Wairoa is open. Single lane in places.
- 👉 SH2 Wairoa to Napier - closed.
- 👉 SH35 Tolaga Bay to Te Puia Springs - closed.
- 👉 Local roads are still being assessed, we'll add in a separate post soon.
- 👉 The air space above Tairāwhiti is closed to private aircraft as personnel and supplies are being brought into our region.



Waka Kotahi NZ Transport Agency - Hawke's Bay and Gisborne

March 23, 2023 ·

Tomorrow morning (Friday 24 March), another section of State Highway 38 in Hawke's Bay will open to general traffic—the section from Tuai to Aniwaniwa Falls will open in the morning at 7am.

Since 13 March, the road has been open from Wairoa to Tuai and work has continued on installing safety barriers and slip clearing. You'll now be able to use the road right up to Aniwaniwa Falls, with roadworkers having completed slip clearing and general clean-up.

SH38 was significant... See more



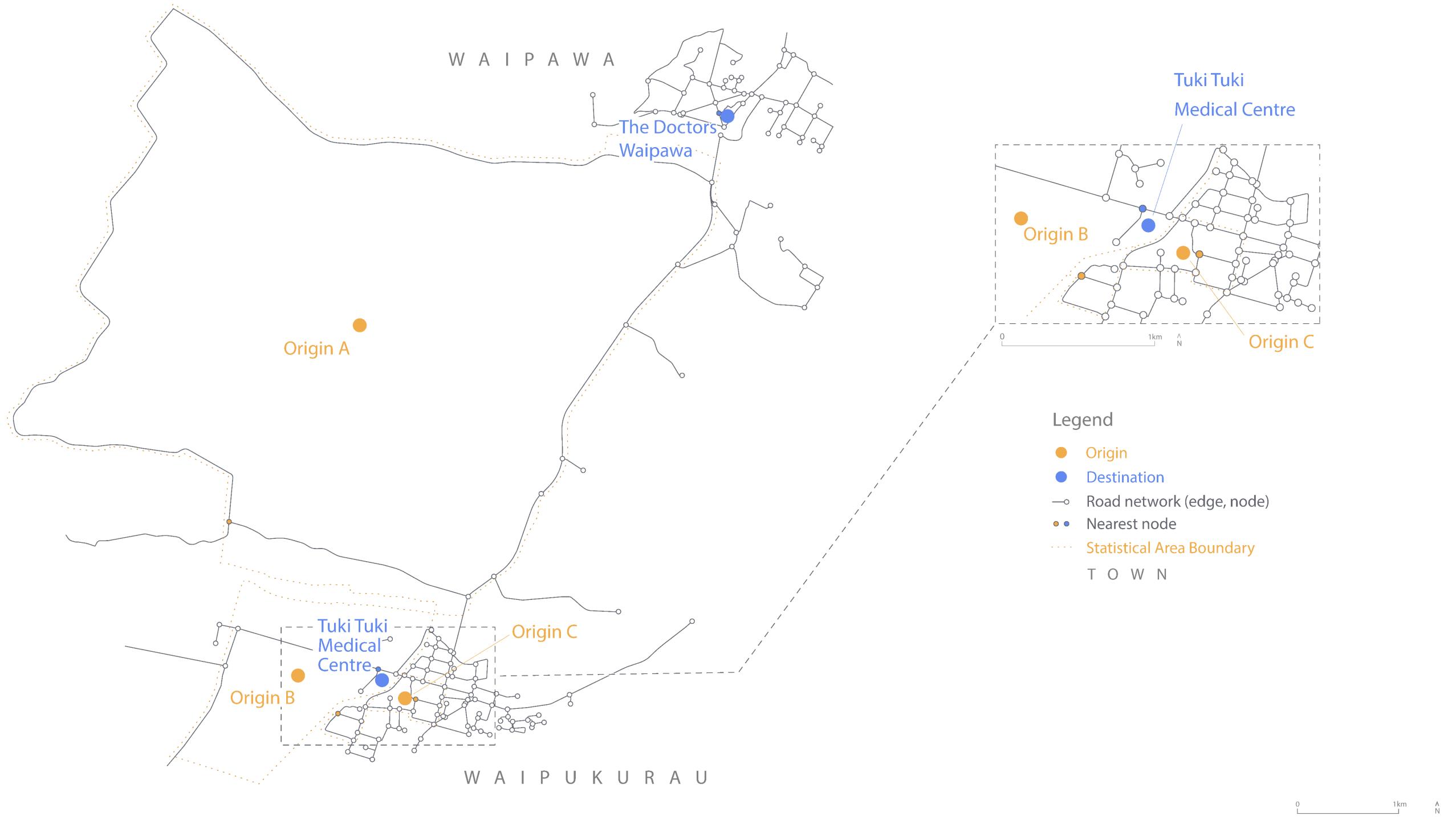
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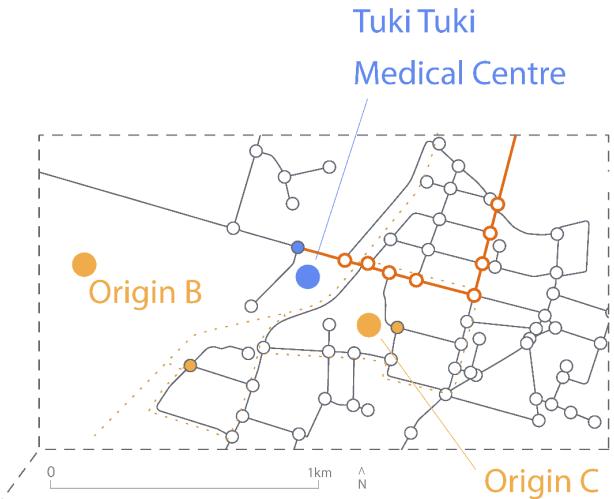
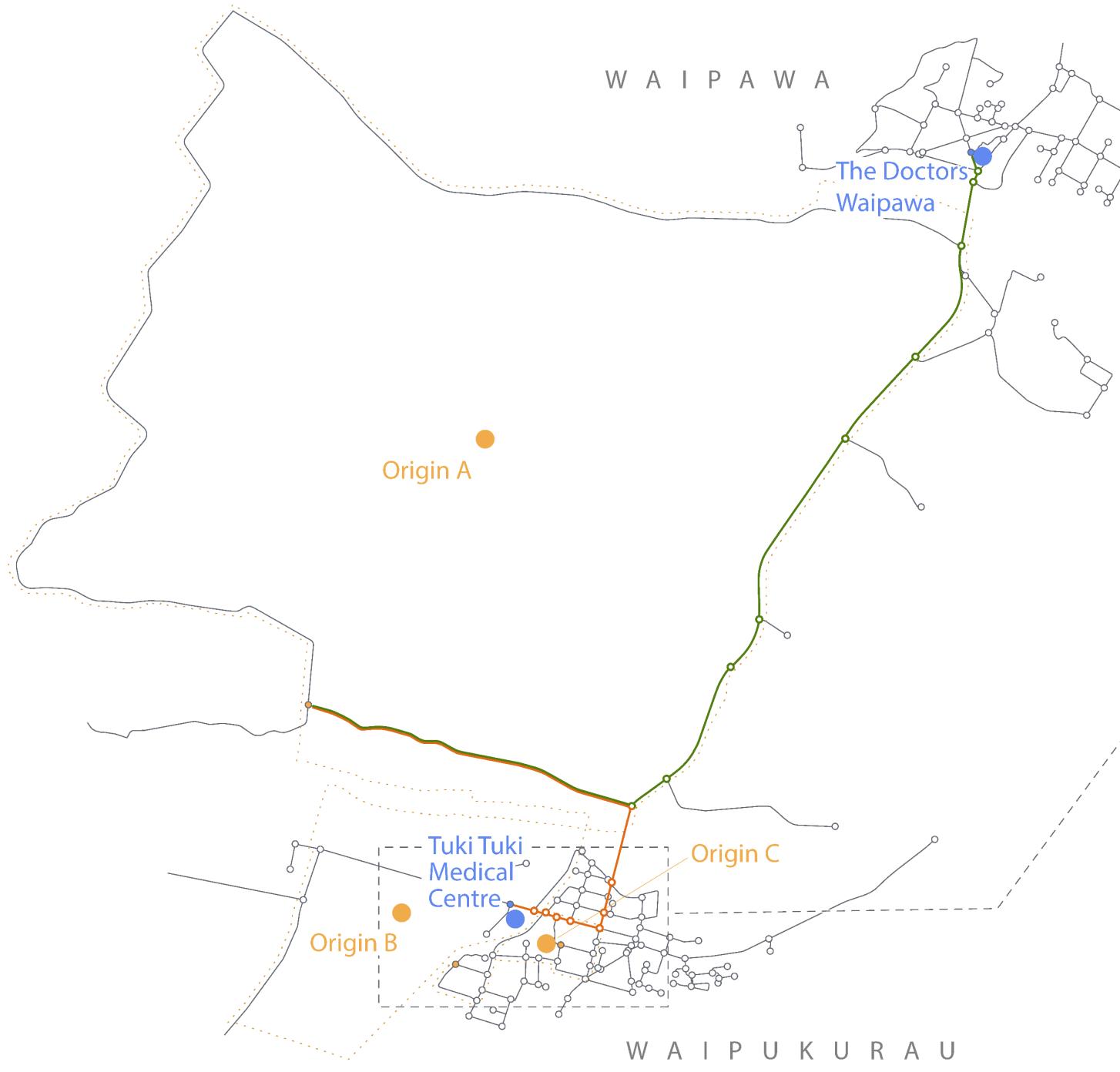


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Legend

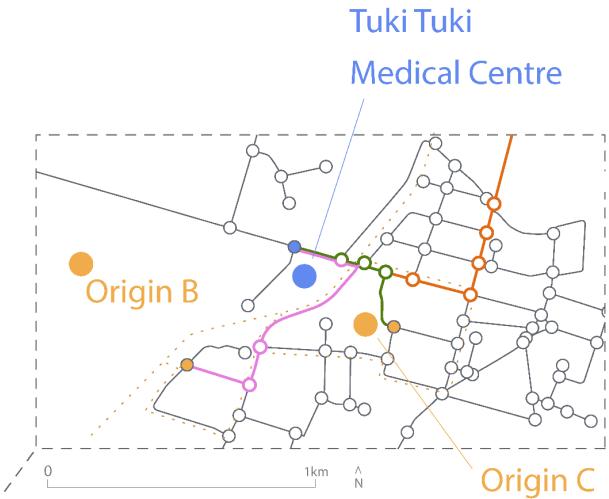
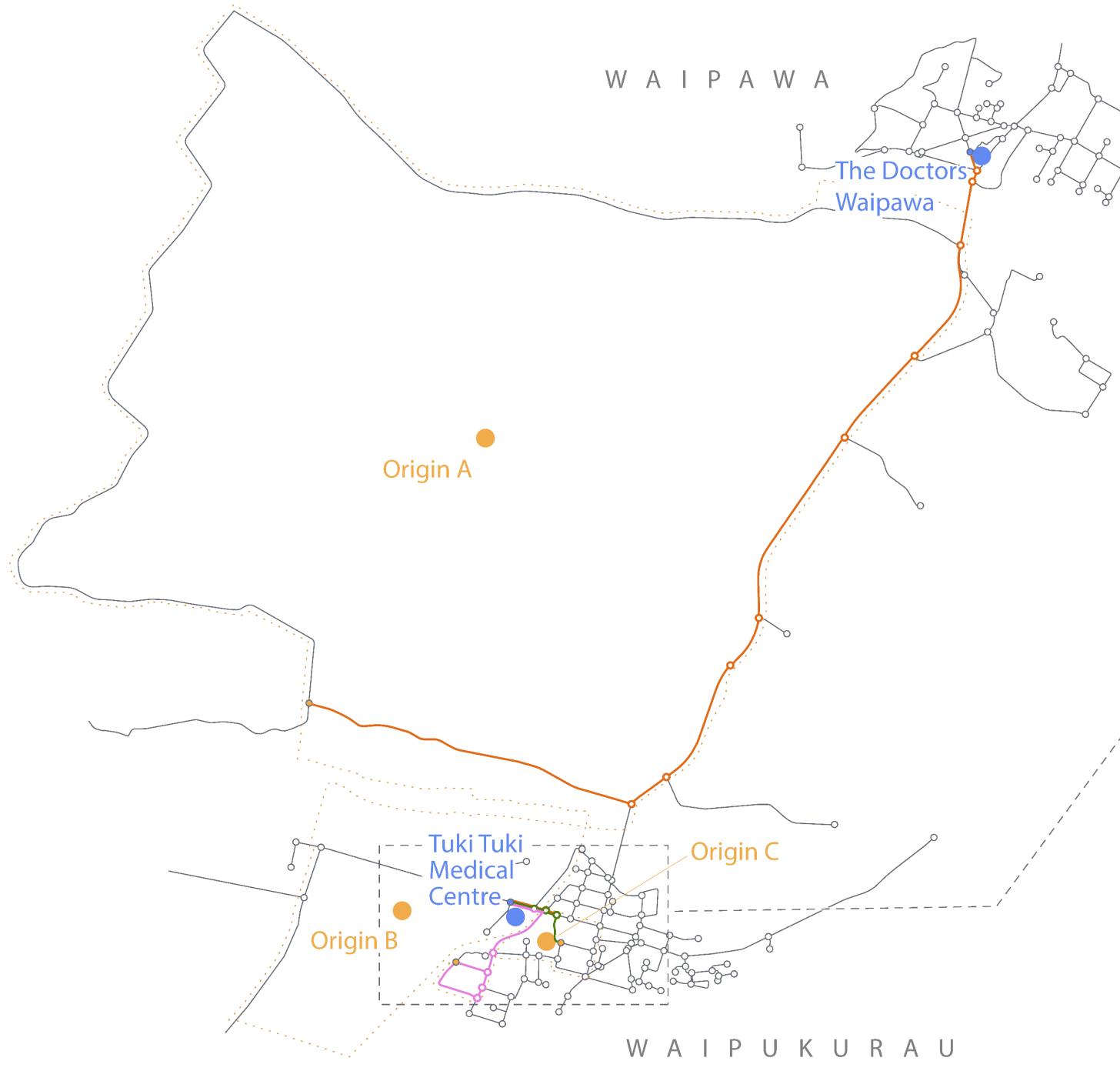
- Origin
- Destination
- Road network (edge, node)
- Nearest node
- Statistical Area Boundary

T O W N

Routing

- Origin A - Tuki Tuki Medical Centre
- Origin A - The Doctors Waipawa

0 1km N



Legend

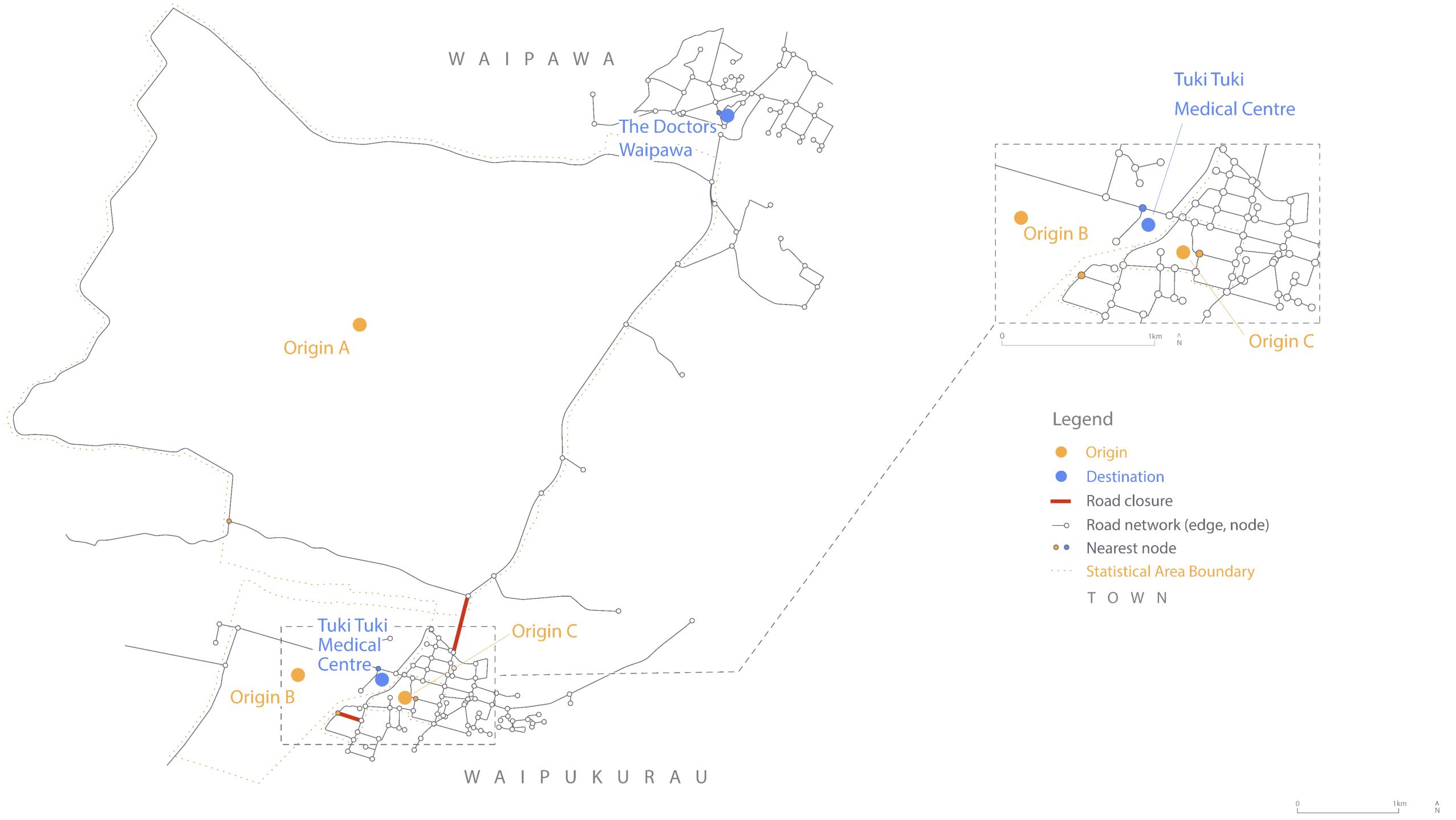
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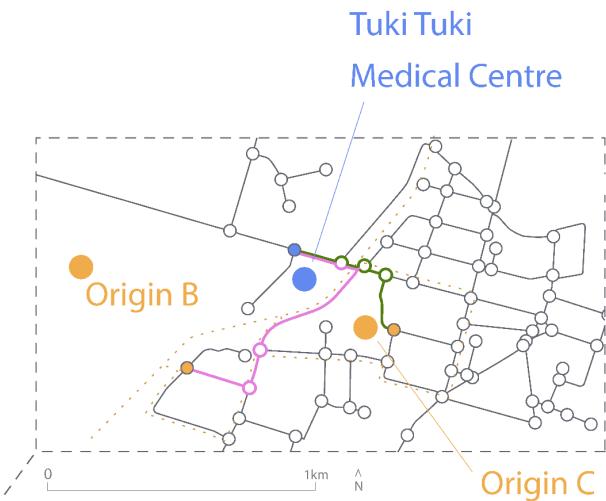
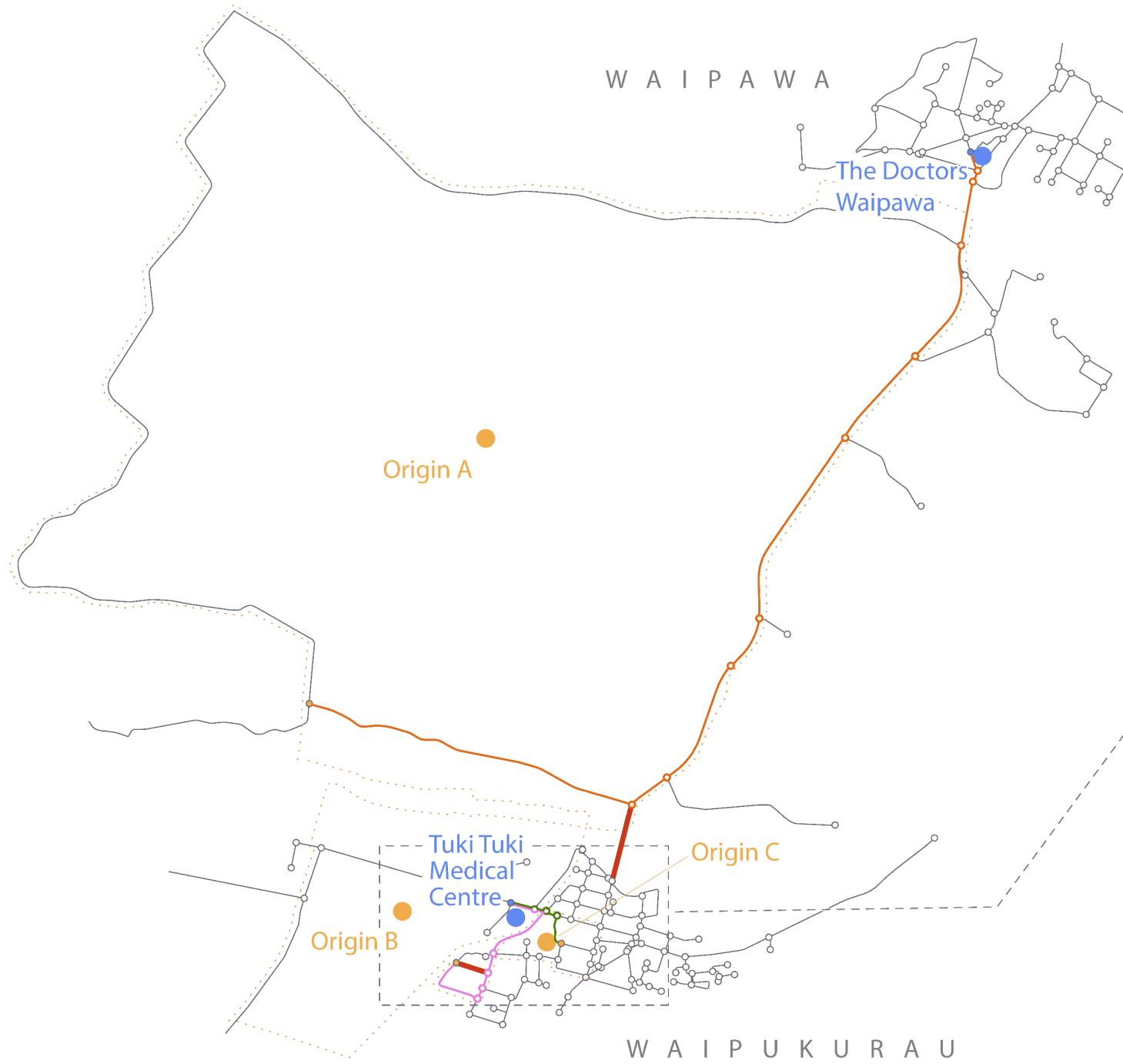
T O W N

Routing

- Origin A - The Doctors Waipawa
- Origin B - Tuki Tuki Medical Centre
- Origin C - Tuki Tuki Medical Centre

0 1km N





Legend

- Origin
- Destination
- Road closure
- Road network (edge, node)
- Nearest node
- Statistical Area Boundary

T O W N

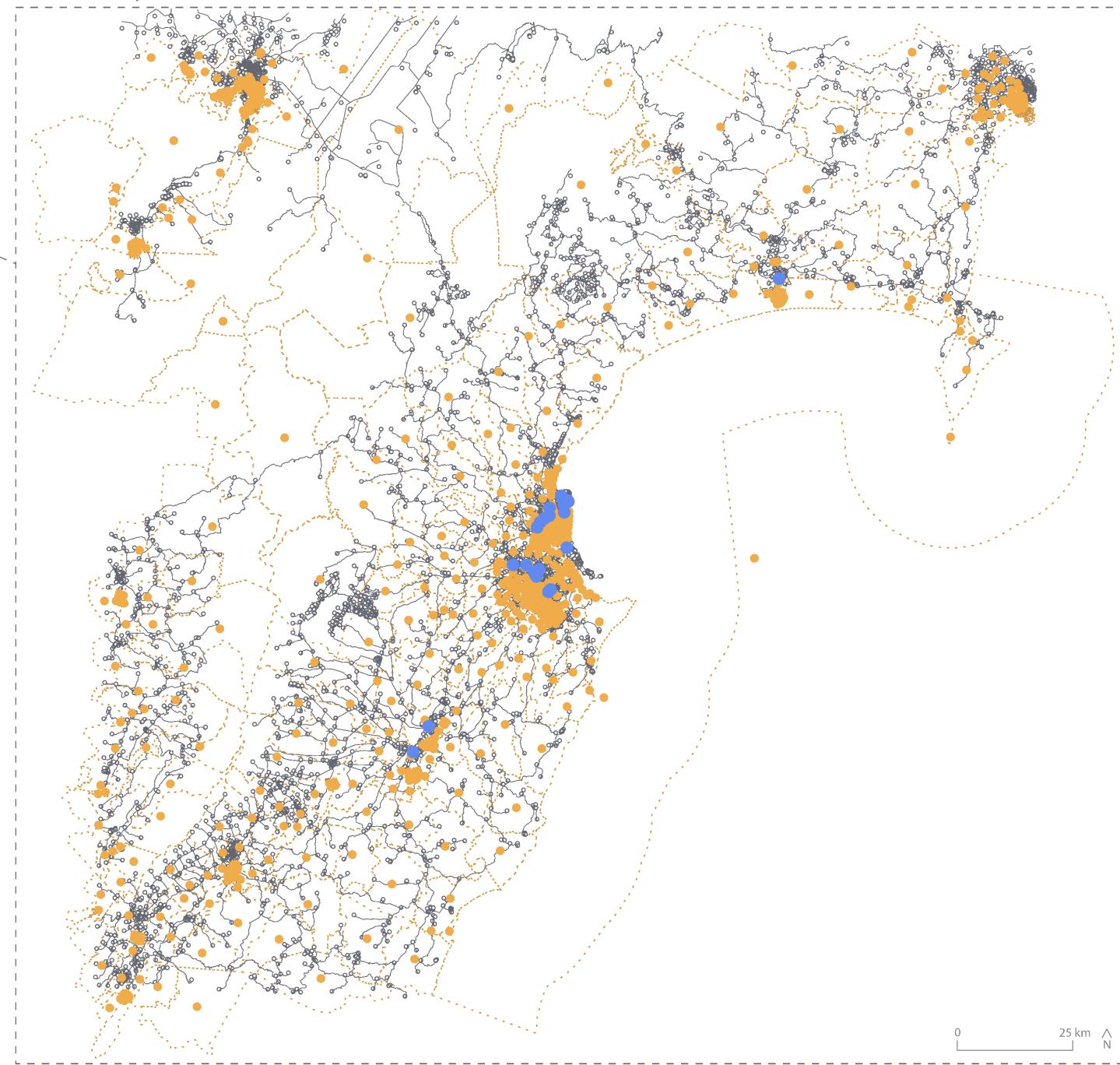
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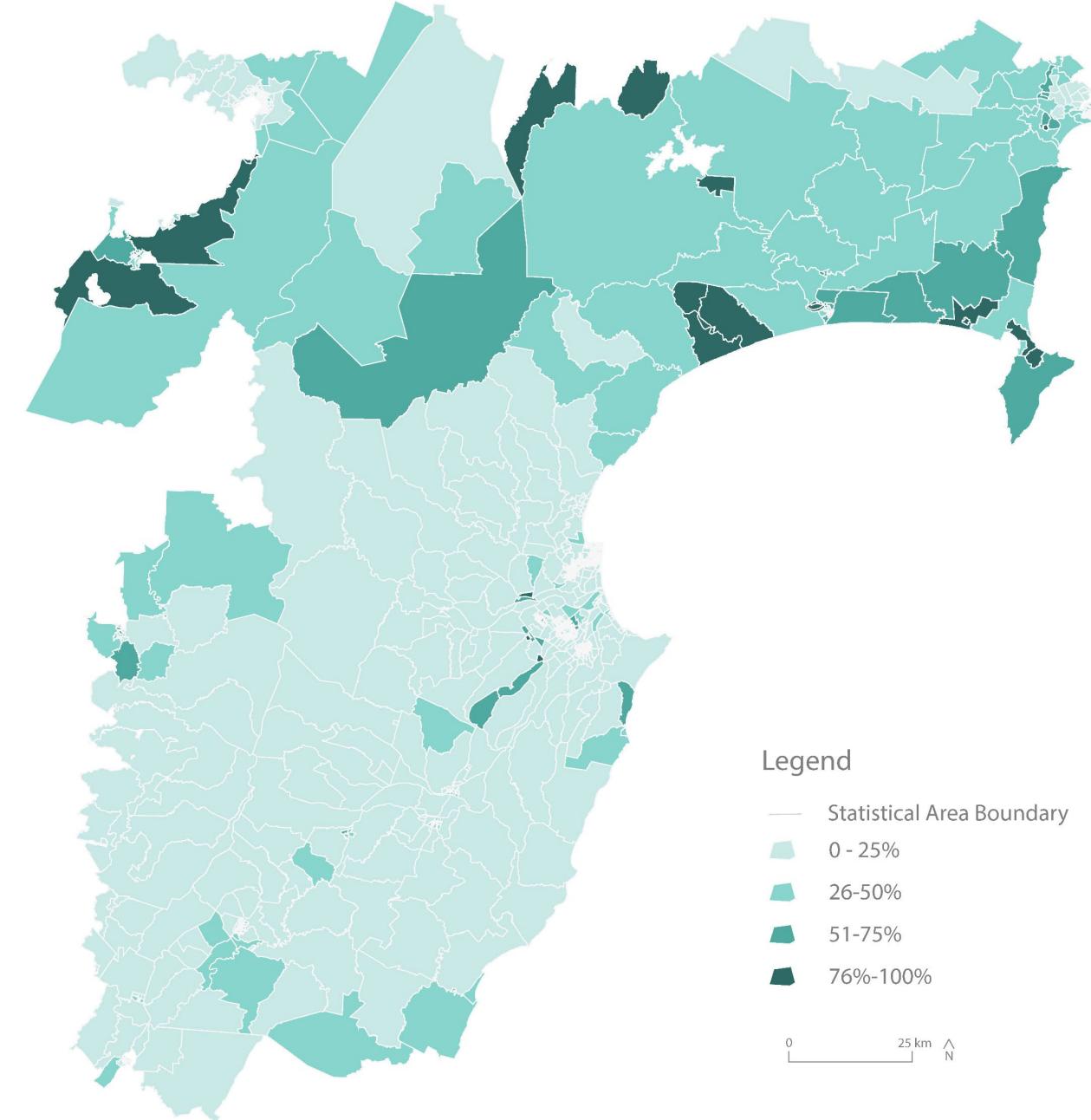
Hawke's Bay, New Zealand



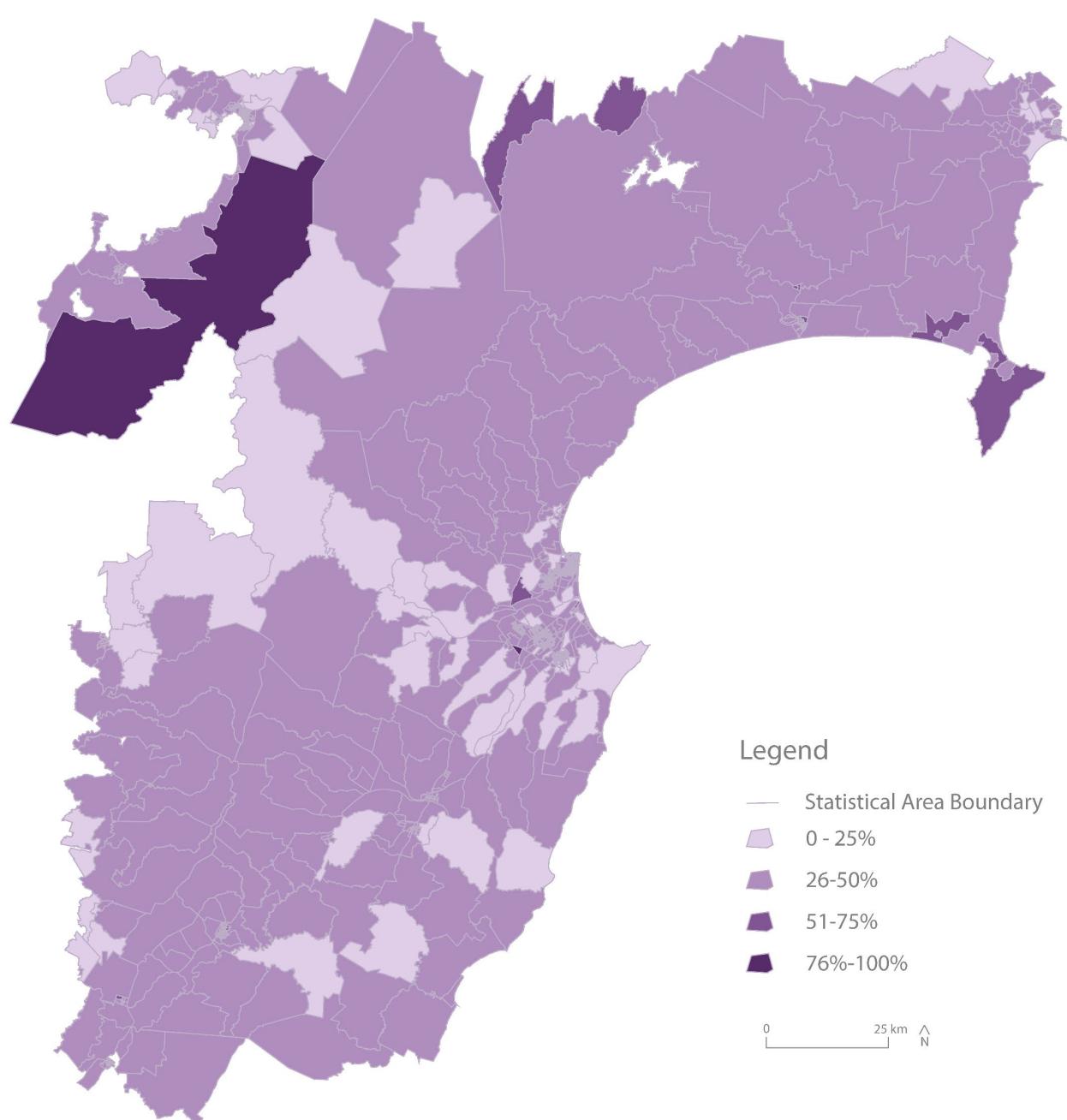
Legend

- Centroid
- Statistical Area Boundary

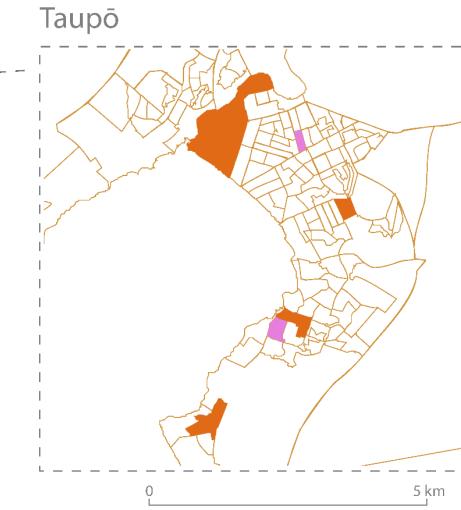
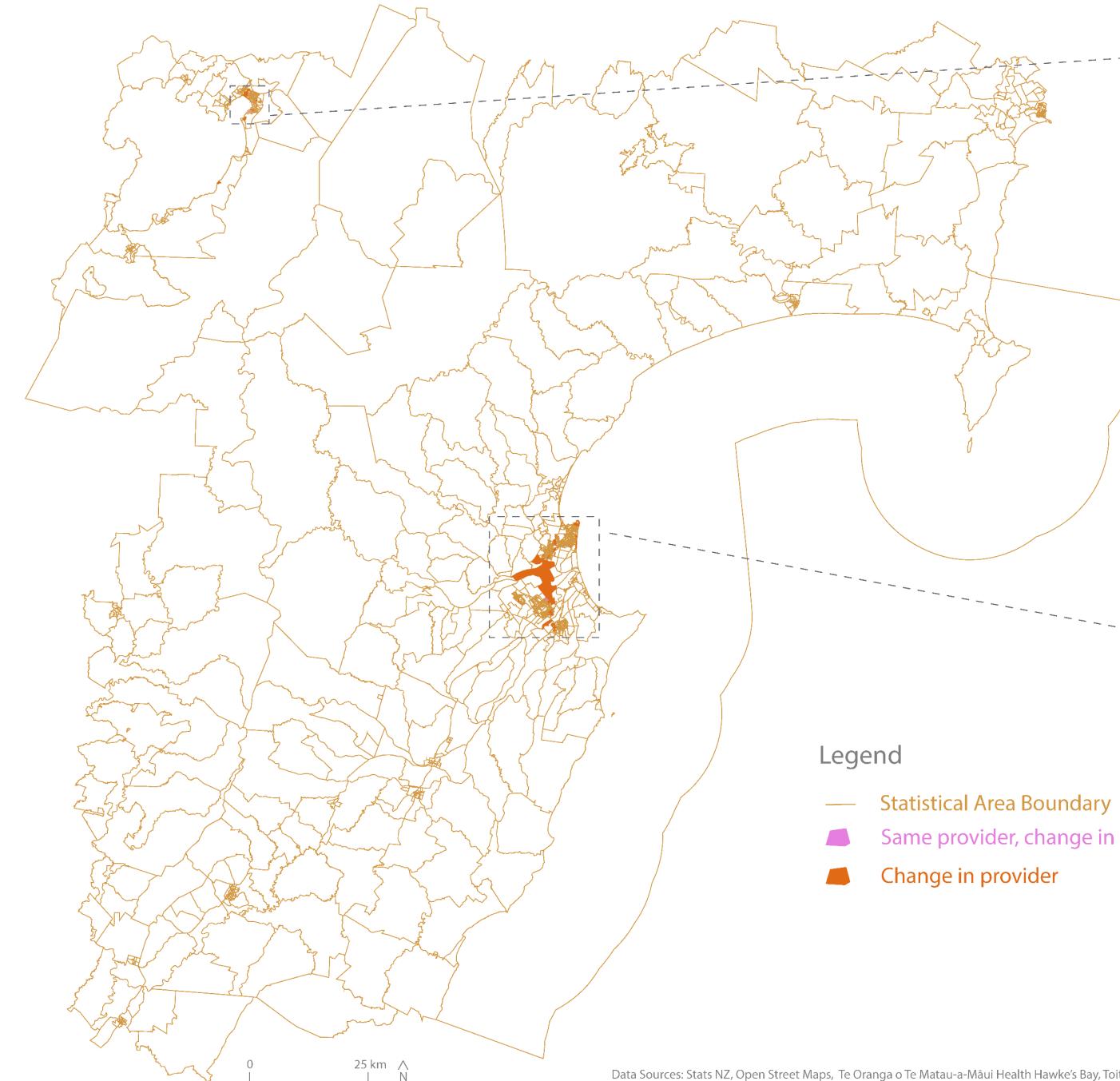
Percent Māori (self identified ethnicity)



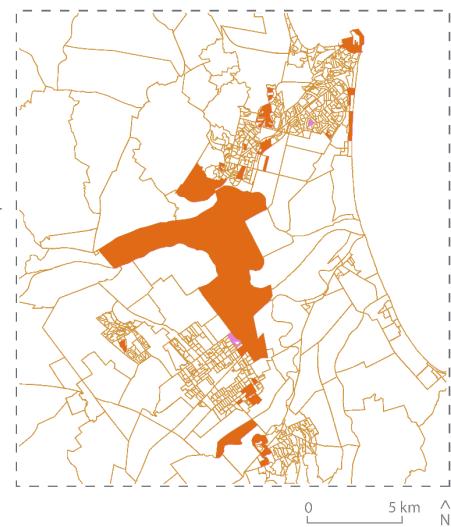
Percent Low Income



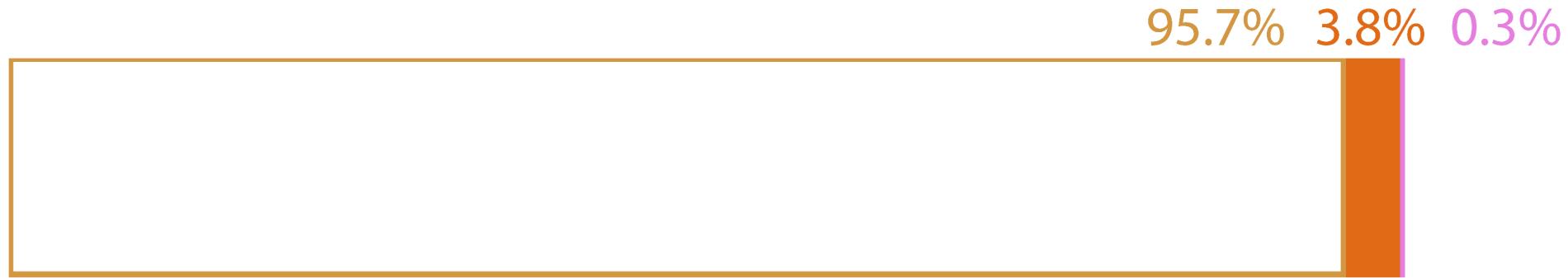
Impacted Statistical Areas



Napier, Hastings,
& Havelock North



Out of 1471 statistical areas...



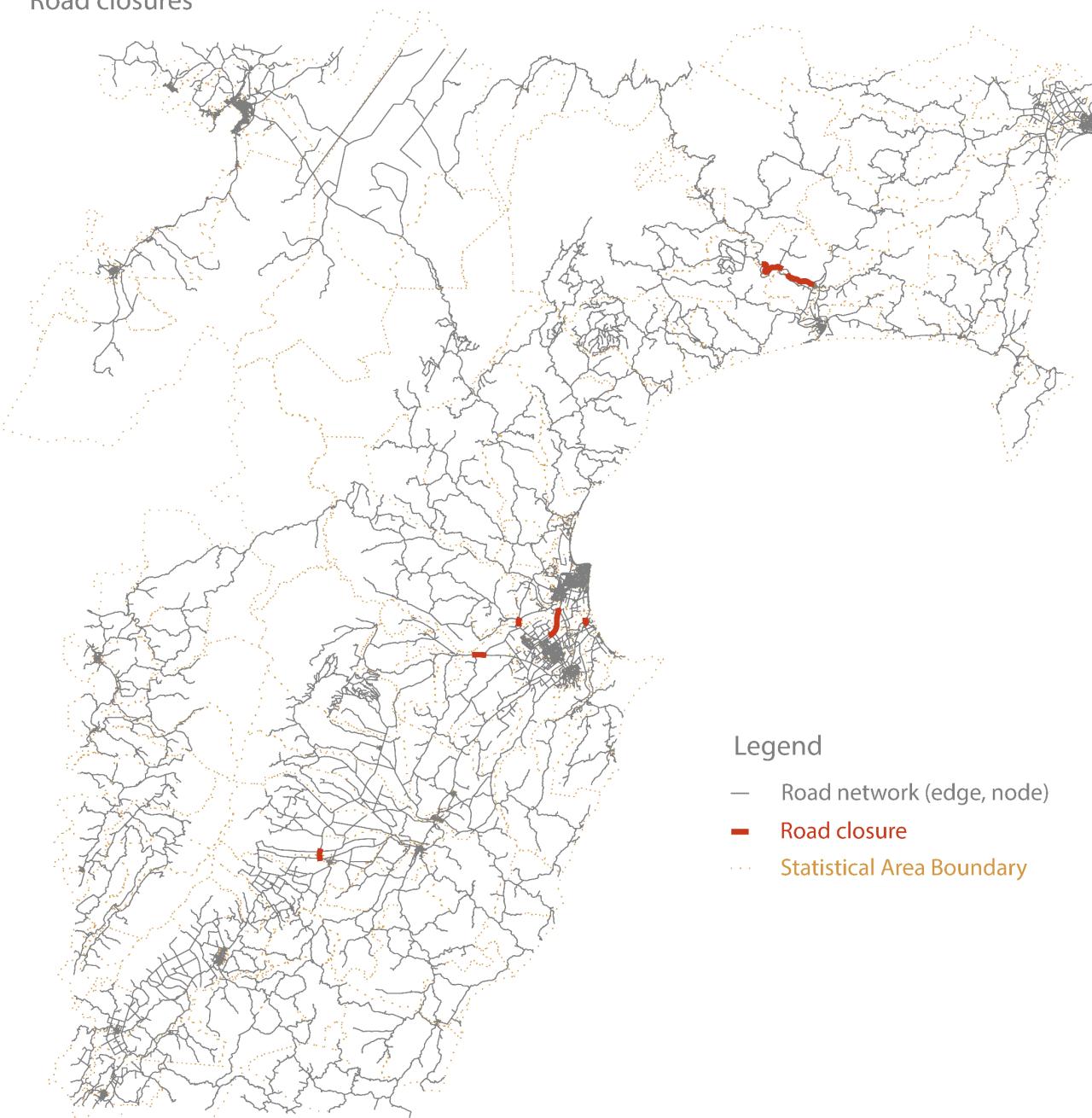
57 were rerouted to new providers

&

5 had to travel further to their original provider

Population Characteristic	T-Test Statistic	P-Value
Percent Māori	0.76	0.45
Percent Pacifica	1.19	0.23
Percent low income	0.5	0.61

Road closures

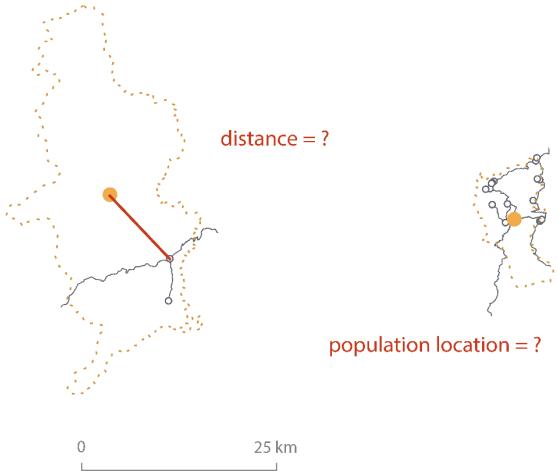


Improvements:

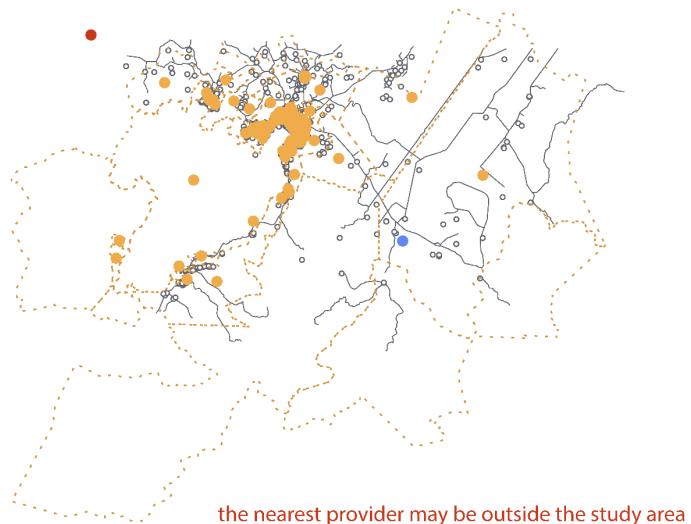
- Fit number of road closures to service area
- Close entire roads

Further Improvements:

Centroid Placement

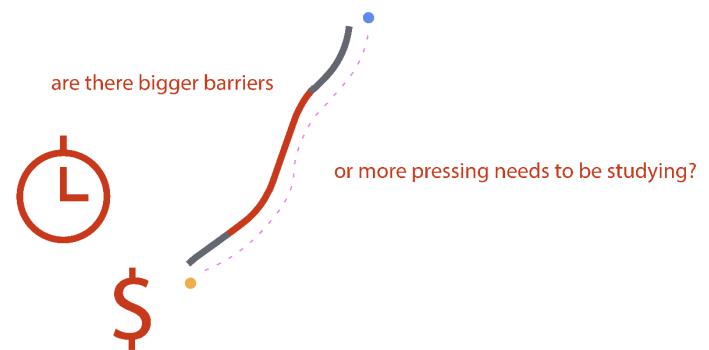
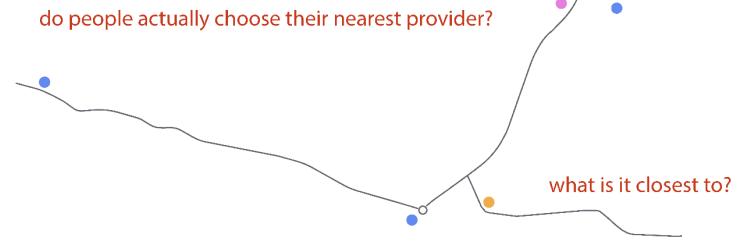


Edge Effects



political boundaries may not align with each other or phenomenon boundaries

Theoretical Constraints



Uses beyond limitations

- Varied applications
 - Road closure modeling in other places/for other storms
 - Vulnerability testing for specific populations
 - Modeling access to different amenities on different time scales
- Improvements to be made
 - Calculating travel time rather than distance only
 - Addressing limitations

Thanks for coming!

- Special Thanks to
 - Pete Nelson
 - Joe Holler
 - Caitlyn Myers
 - Pete Johnson
 - ALL THE NZ PEOPLE WHO RESPONDED TO ME!
 - The sandbox crew <3

References