

The logo consists of a black-outlined rectangle containing the word "ORBICA" in bold, black, uppercase letters. From the bottom-left corner of this rectangle, two lines extend downwards and outwards to form a triangular shape, pointing towards the bottom-left corner of the main title box.

**ORBICA**

# **CRASH ANALYSIS SYSTEM**

**GeoIT Wherecamp  
14 November 2019**

**O R B I C A . W O R L D**

# Orbica provides solutions & products in digital geography:

- Geospatial
- Software Development
- Remote sensing
- GeoAI





Our **purpose** is simple

“To enhance billions of lives through the power of geography.”





Client



Orbica

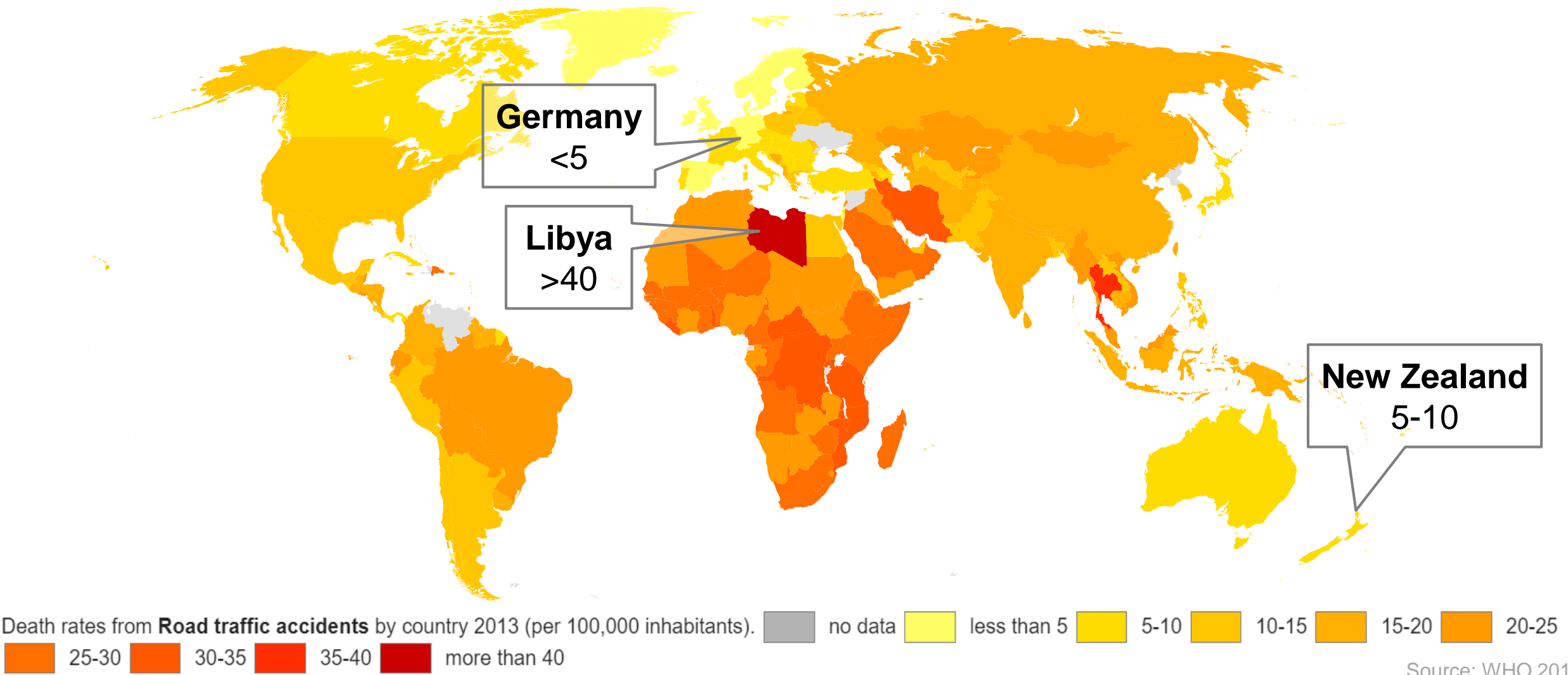


Partner



# Death Rates from Road Traffic Accidents

Per 100,000 inhabitants. 2013





# Global Crashes

1.35M

people are killed on roadways around the world annually

8<sup>th</sup>

leading cause of death

3,700

people killed in road traffic crashes daily

- Motorcycles
- Pedestrians
- Bicycles
- Cars
- Buses
- Trucks

# NZ Crashes

1.5M

Crashes since 1980

46,000

Fatal or serious crashes  
since 2000

\$17B

For transport  
improvements

4.7M

Population (2017)



- Complete, detailed and relatively good data quality
- Crashes occur for many reasons - to be identified / analysed

# Project Aim

- easy access to crash database
- analysis tools for transport agency & road safety professionals
- empower users to make data-driven decisions

**Make NZ road network safer**

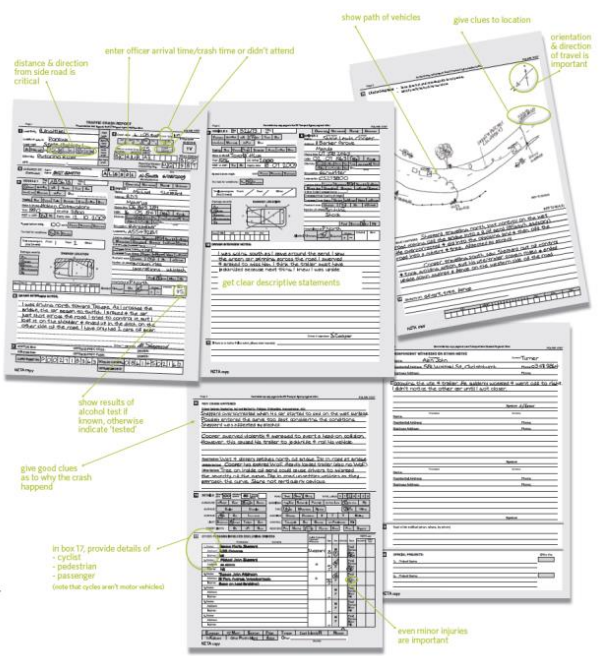




# Old Process

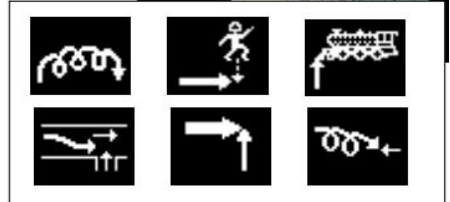
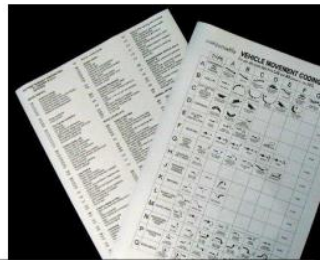
## Crash Reports

- Very detailed

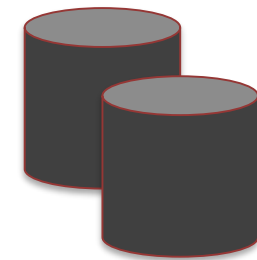


## Report Processing

- data entry
- crash & factor coding
- georeference



## Microsoft Data Warehouse



- >100 Fields
- 1.5M records
- Huge amount of docs/images

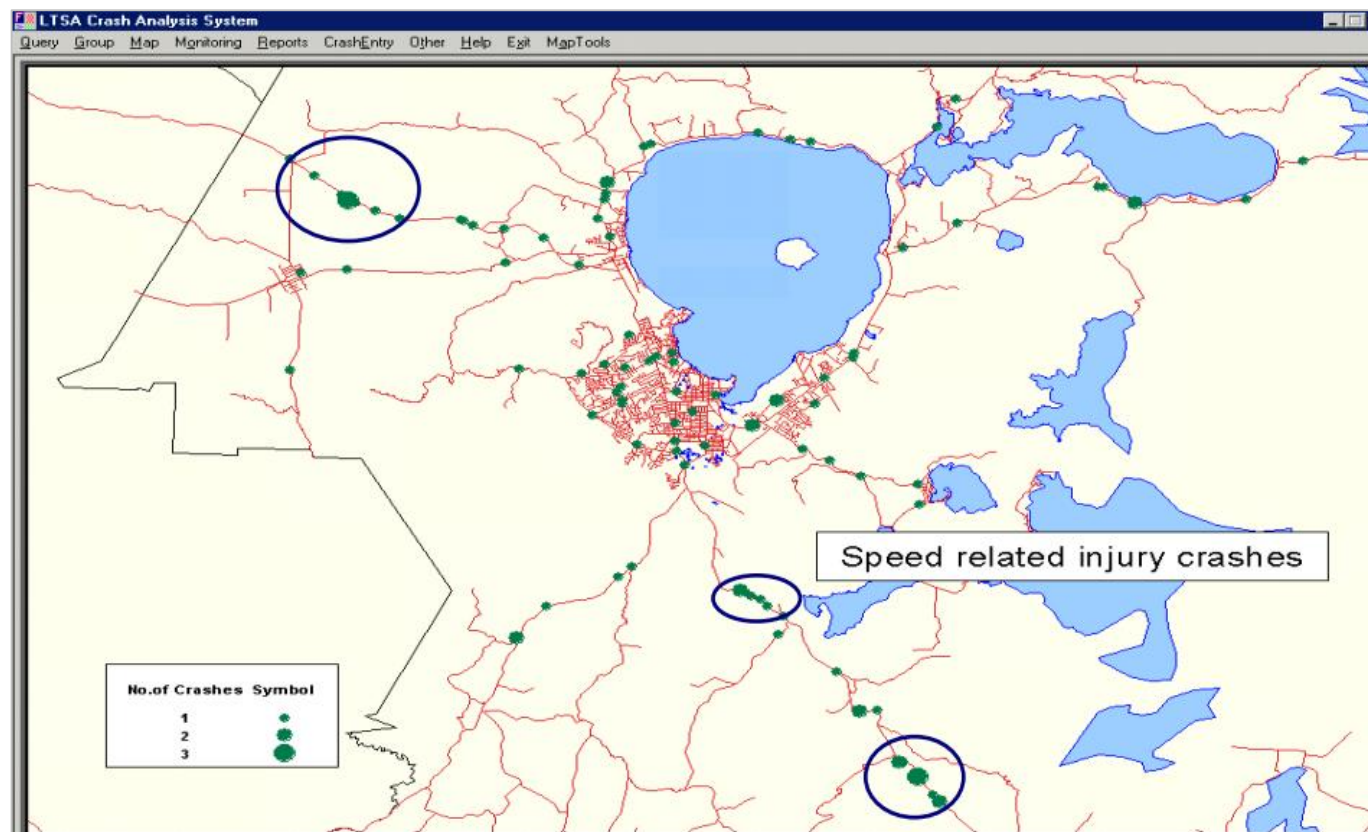
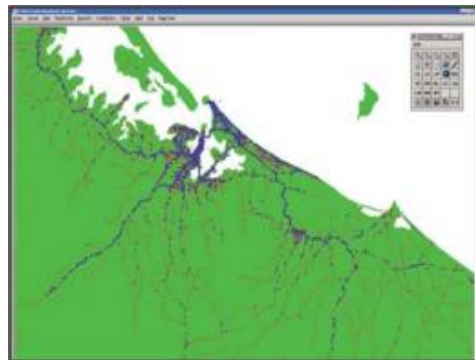


## Diffusion



Old CAS

- 20 years old!
- Usable
- Not nice to use



# Guidelines

- Open source
- Modern web environment
- Have all old features
- Mustn't scare away long-term users
- Focus on UI and UX
- Map component central
- Easily create complex queries without code
- Cross platform, browser
- Fully agile development
- High client involvement





# Obstacles & Challenges

1.5M

Features to

- Query
- Spatially cluster
- Display in web map
- Display in dynamic collision diagrams

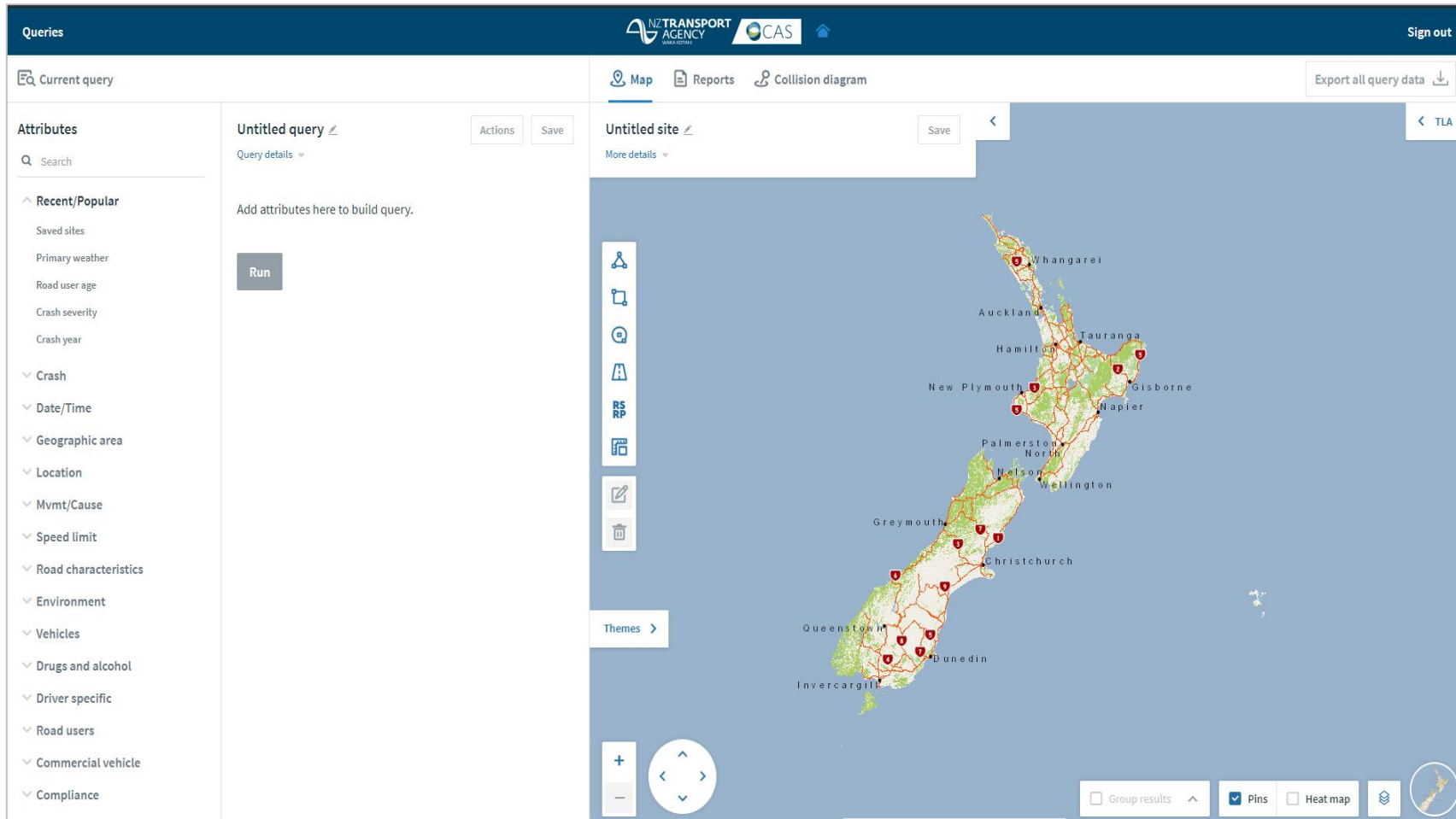
- Query through websocket call
- Result streamed along network
- Label engine based on Spatial index(GRID) & AI(genetic algorithms)
- Hybrid link between diagram and mapping component



# Technology Stack



# Query Builder

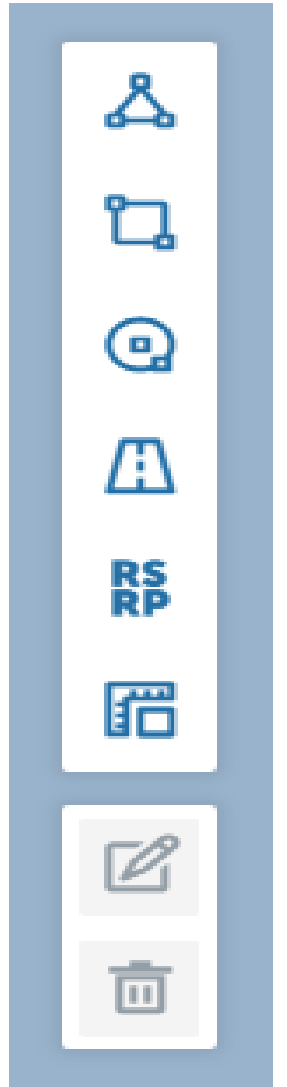


- Easily create complex queries
- No coding
- Spatial & non-spatial
- Intuitive controls e.g. drag and drop
- Save and share queries

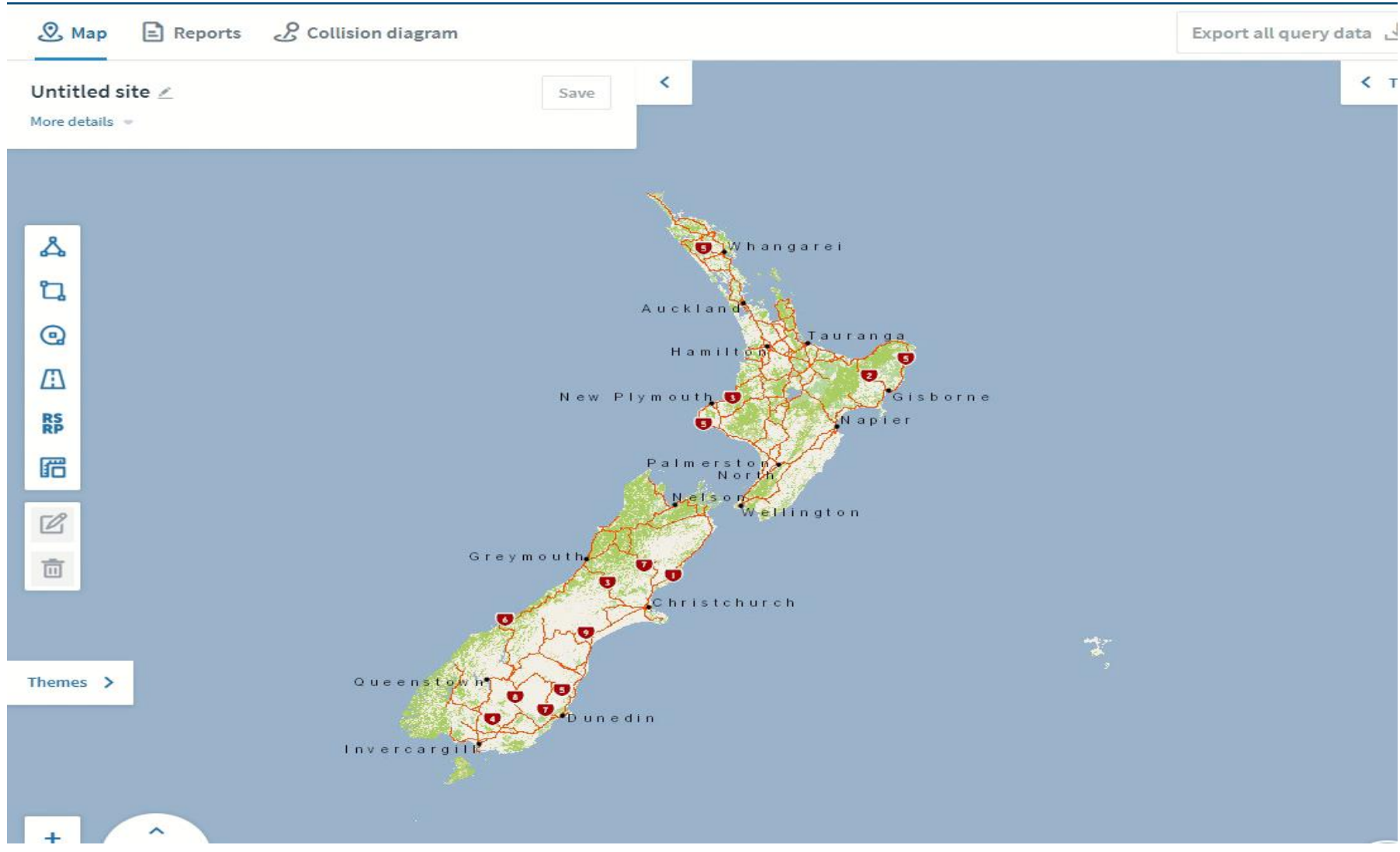


# Custom Leaflet Control Toolbar

- Goal: To build standardized leaflet control from heterogenous existing leaflet plugins.
- To keep consistent behavior on all menu items, specially on edit and delete.



# Custom Leaflet Control Toolbar



# Pixi.js WebGL

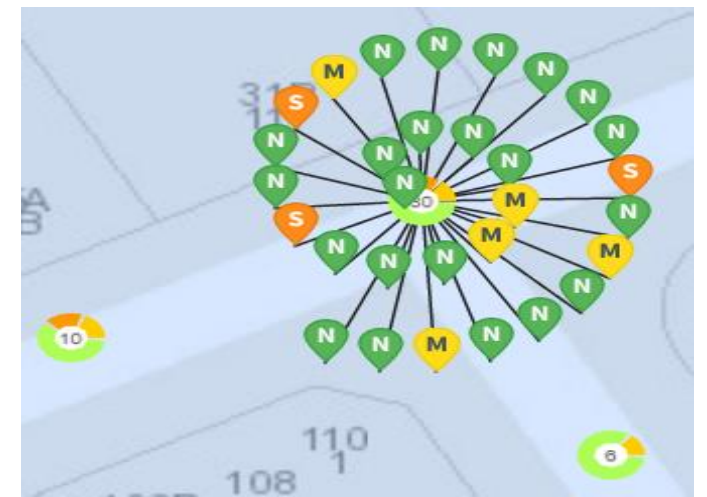
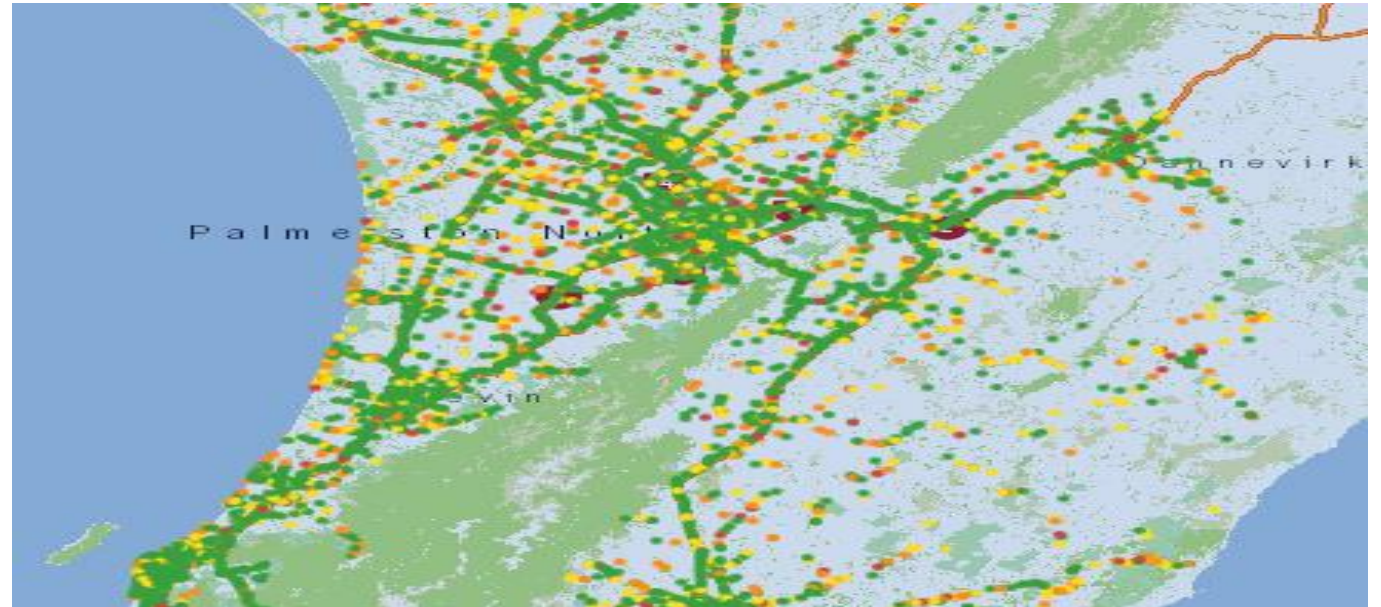
- Open source library
- create rich, interactive graphic experiences
- Multi platform
- Powerful, fast, & simple





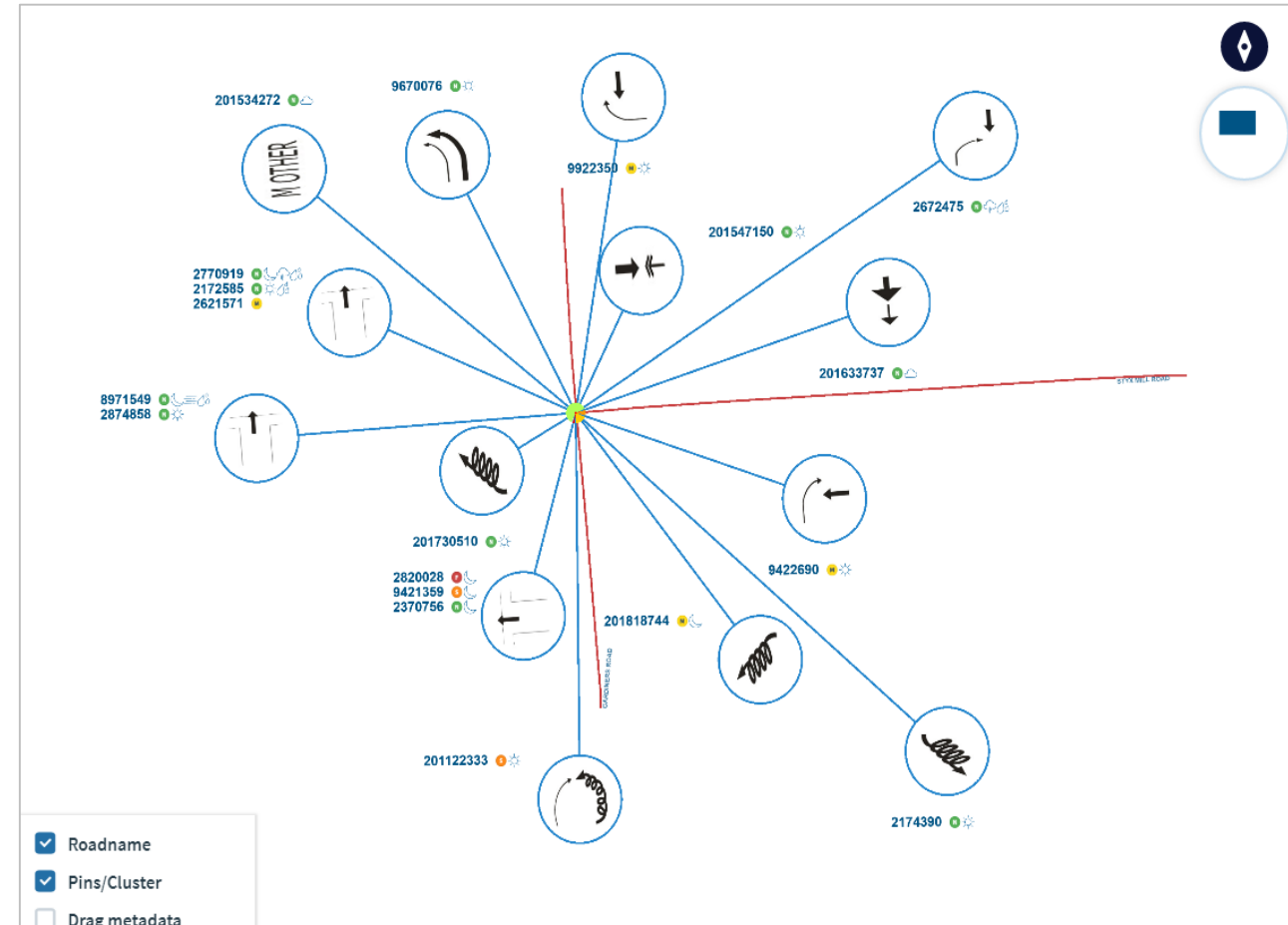
# Leaflet Grouping with Pixi WebGL

- Need to visualize big data on map
- Used Spatial indexing and clustering algorithm to create groups and markers.
- Pixi.js for rendering.
- Integrated Pixi with Leaflet



# Collision Diagram with Pixi WebGL

- Used Spatial indexing (Quadtree)
- Rule based placement of Pixi elements
- Complex algorithm to generate diagram
- Scale change on diagram zoom in/out.
- Draggable components



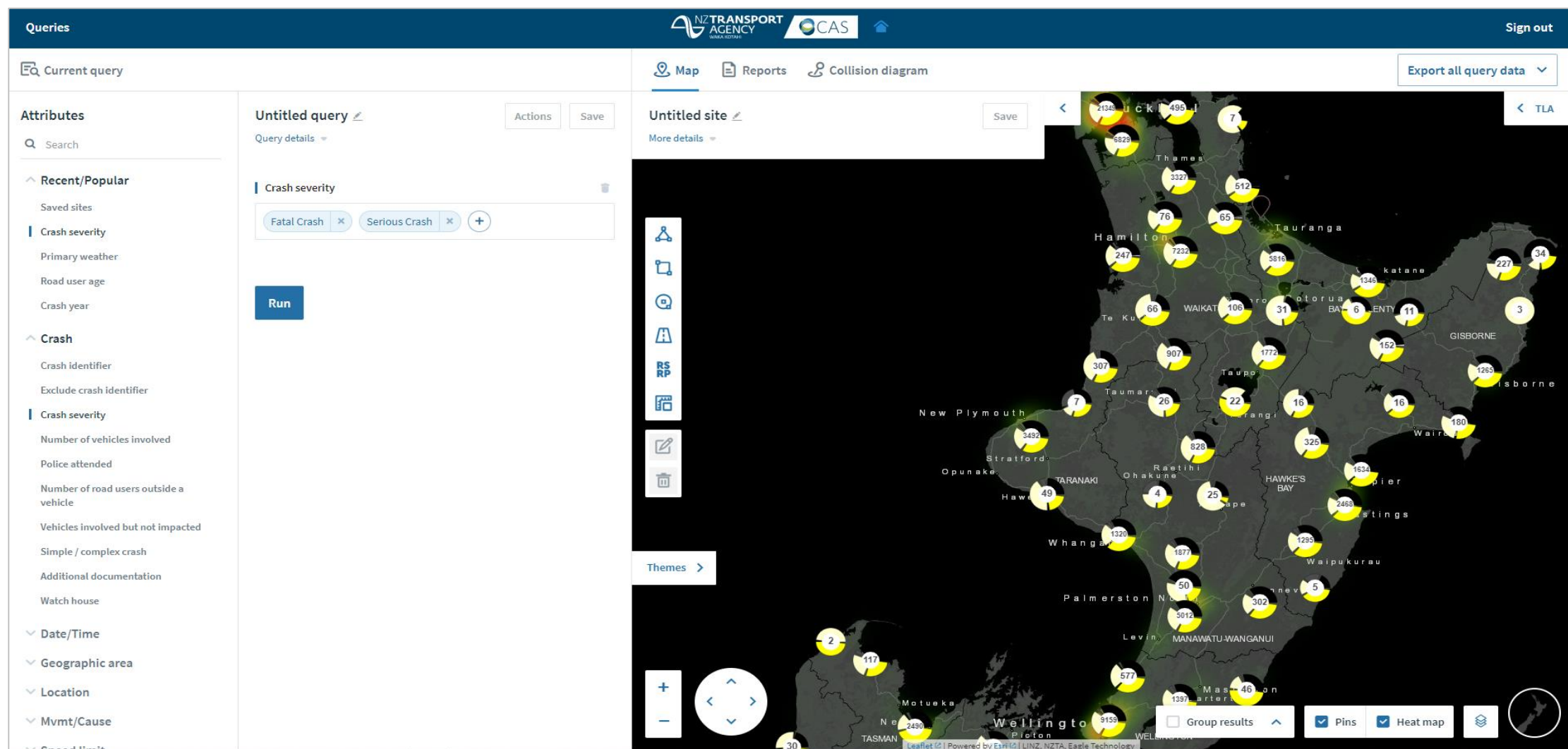
# Collision Diagram with Pixi WebGL

The screenshot displays the CAS (Collision Analysis Software) interface, which is used for generating collision diagrams from map data. The interface is divided into several sections:

- Top Bar:** Includes the NZ Transport Agency logo, the CAS logo, and a 'Sign out' button.
- Navigation:** A tabbed interface with 'Map', 'Reports', and 'Collision diagram' tabs. The 'Map' tab is currently active.
- Left Sidebar:** Contains a search bar and a list of filters for the current query, including 'Recent/Popular', 'Crash severity', 'Saved sites', 'Crash year', 'TLA (Territorial local authority)', 'Alcohol Involved', 'Crash', 'Date/Time', 'Geographic area', 'Location', 'Mvmt/Cause', 'Speed limit', 'Road characteristics', 'Environment', 'Vehicles', 'Drugs and alcohol', 'Driver specific', 'Road users', 'Commercial vehicle', and 'Compliance'.
- Main Map Area:** Displays a map of a residential area with a blue collision diagram overlaid. The diagram shows a central intersection with a circular path and several rectangular paths extending from it. The map includes street names such as 'Masons Ln', 'Stout Street', 'Willmore Street', 'Featherston Street', 'Waring Taylor Street', 'Johnston Street', 'Brandon Street', 'Maginnity Street', 'Eallora Street', 'Bunny Street', 'Lady Elizabeth Ln', and 'Watetoe Quay'. A 'Run' button is visible on the left side of the map area.
- Right Panel:** Contains a 'Query details' section for 'bani f1' with a 'Last saved' timestamp of '11/11/2019, 10:54 AM'. It also includes a 'Crash severity' filter with 'Fatal Crash' and 'Serious Crash' options, and a 'Saved sites' filter with 'bani f1' selected. A 'Run' button is located below these filters. At the bottom right, there are settings for 'Open size (m)' (250), 'Urban size (m)' (35), and checkboxes for 'Group results', 'Pins', and 'Heat map'.



# Map Query Results



# Reports and Charts

Traffic Crash Report

This report contains private information which you are not allowed to divulge to anyone. Please review your obligations under the privacy agreement.

Print this report

Crash ID: [REDACTED]Severity: MINOR

Crash date: [REDACTED]Crash time: [REDACTED] am

Crash road: [REDACTED]  
Side road (or feature): L [REDACTED]  
TLA: Christchurch City

Placement: Midblock  
Vehicles: 2  
Other parties:

Police attended: No  
Officer number: [REDACTED]

What happened?

Location and environment

Vehicles

Pedestrians

TCR legacy documents

Coding summary


What happened

[REDACTED] is travelling south on [REDACTED] below the posted 60kph limit. About 20 metres prior to junction driver realises she is going the wrong way and indicates to turn right and brakes.

Witness one in the car behind also slows and indicates left to turn at approaching junction.

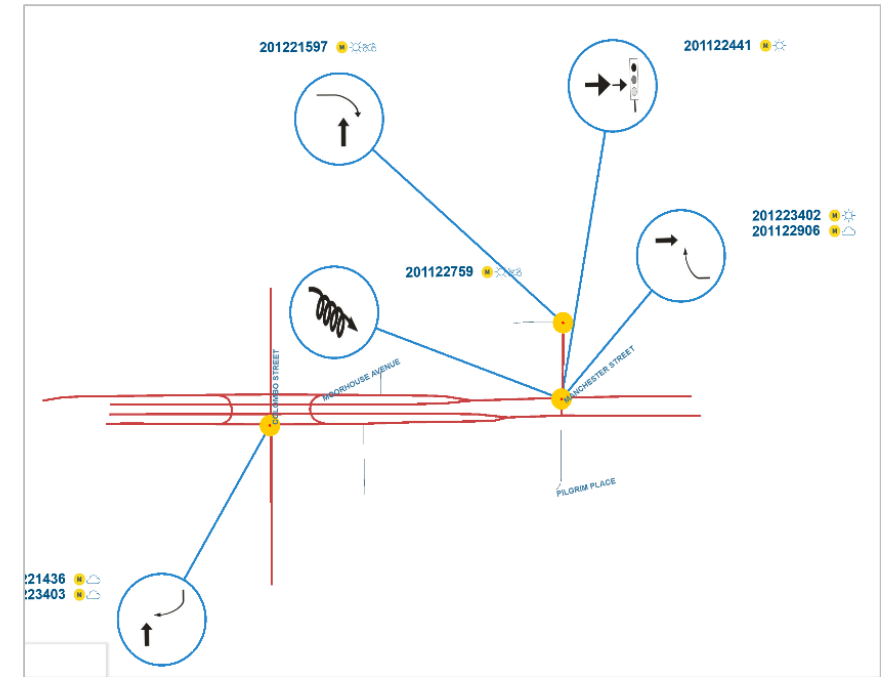
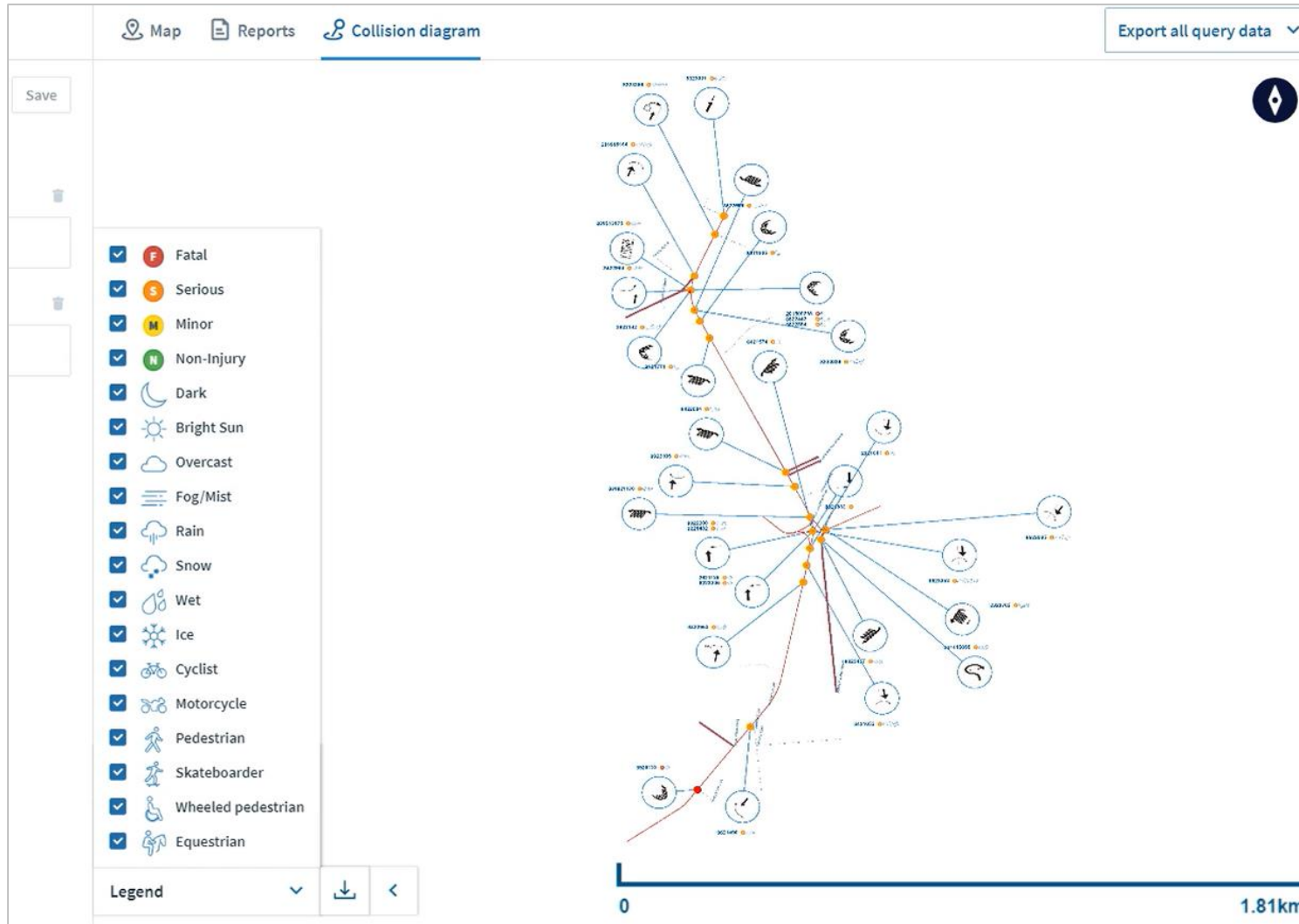
[REDACTED] behind witness moves to pass witness and finds road blocked by [REDACTED]. He brakes and slides on wet road into right side doors of [REDACTED]. This causes damage and injury.

NOT TO SCALE



Output complex collision diagrams and reports to help experts target and advocate for road safety improvements

# Collision Diagrams



Output complex collision diagrams and reports to help experts target and advocate for road safety improvements

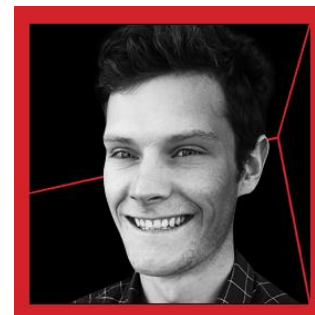


Crash Analysis System is now  
being used by 4000 professionals to  
make New Zealand's roads safer





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**A FUTURE OF EXPERIENCE, INNOVATION AND CREATIVITY**

**Know the world, change the world...**