SAFE SOFTWARE

Ground-truthing Routing Analytics

An Auckland Ferries Casestudy

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Auckland Transport (AT)

- Responsible for all the region's transport services, excluding State Highways
- Includes roads, footpaths, cycling, parking and public transport
- (AT) actively promotes alternative modes to get around the local transport network
- (AT) recognise that multi-modal transport services must be interoperable

Auckland Transport (AT)

- Data interoperability projects (APIs)
- RAMM interoperability projects
- Public transport levels-of-service models (GTFS)
- Asset renewals funding optimisation modelling
- Geocoding initiatives
- Open-Data publishing initiatives
- HOP-Card analytics project
- SharePoint metadata harvesting project
- Network modelling projects

Auckland Transport's Strategic Themes

- Prioritise rapid, high-frequency public transport
- Continually transform and elevate our customer's experience
- Build network optimisation and resilience for travel times
- Enable quality urban growth to meet demand
- Fast-track creative, innovative and efficient transport services

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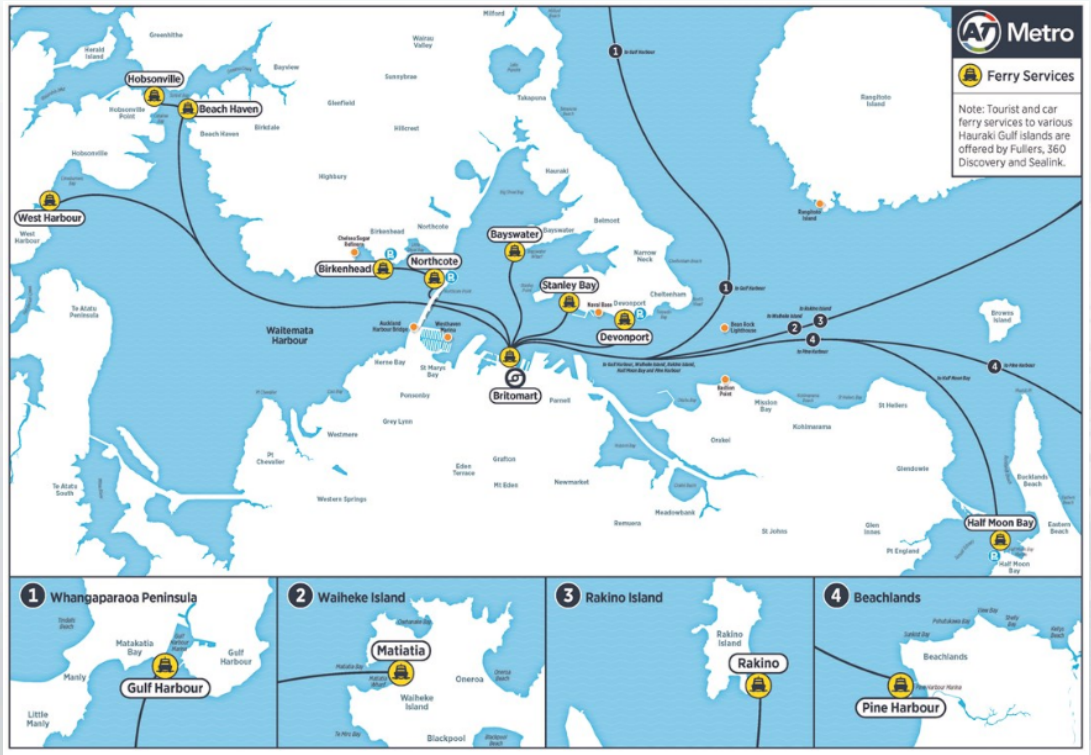
Auckland is a Harbour City

- Ferries have been part of Auckland's fabric for over 150 years
- Auckland Transport (AT) operates 13 ferry routes
- There are 21 existing berths, many underutilised
- Fullers360 currently carries 6 million passengers a year [Herald, 8-Jan-2019]
- Fullers360 would like to grow their numbers to 9 million passengers a year by 2025 [Herald, 8-Jan-2019]

Auckland is a Harbour City - 13 Ferries / 21 Berths



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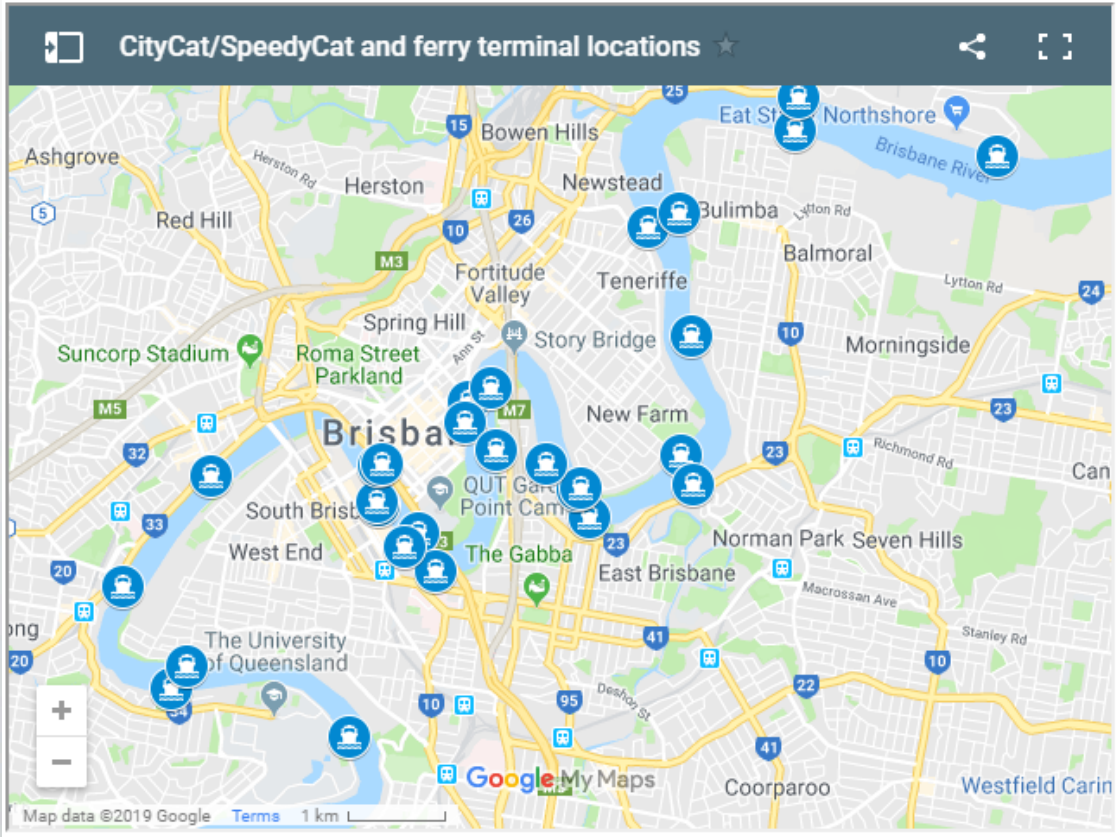
Brisbane is a similar River City - 30 Ferries / 25 Berths



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(AT) has a focus on PT interoperability

- How to get cars off the road and people onto public transport (PT)
- PT is multi-modal
- Multi-modal services need to be interoperable
- Will my {Bus | Train | Ferry | Cycle | Scooter} connect with my {Bus | Train | Ferry | Cycle | Scooter} to get me to where I am going on-time
- Ferries are an underutilised service

Ferry ETA Predictions

- The public will only use Ferries if the service is predictable …

- **ESRI Ferry ETA Prediction REST Service**

  <ferry (gps_x)>, <ferry (gps_y)>, <destination (x)>, <destination (y)>, <route ID>,

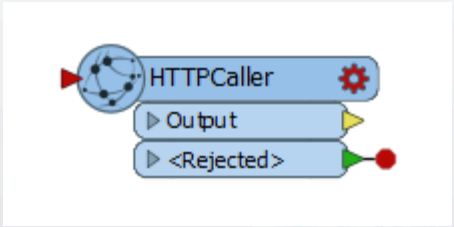
- When called, this REST service returns

  <ETA to destination>, <route distance to destination>

Ferry ETA Predictions

Old (circa 1927) …

New …




```
https://atalgesd01.aucklandtransport.govt.nz/routing/api/routing/eta?startX=@Value(x_nztm)&startY=@Value(y_nztm)&endX=@Value(_end_trip_x)&endY=@Value(_end_trip_y)&routeID=$(ROUTE_ID_NAME)
```

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Ground-truthing Ferry ETA Predictions

Steps to make a better ETA model

1. Process the raw Ferry GPS telemetry for events
2. Swap out cartographic routes for actual routes
3. Swap out assumed average speed for actual speed
4. Quantify accuracy by comparing predicted ETA versus actual ETA
5. Model Ferry ETA Disruptions in real-time

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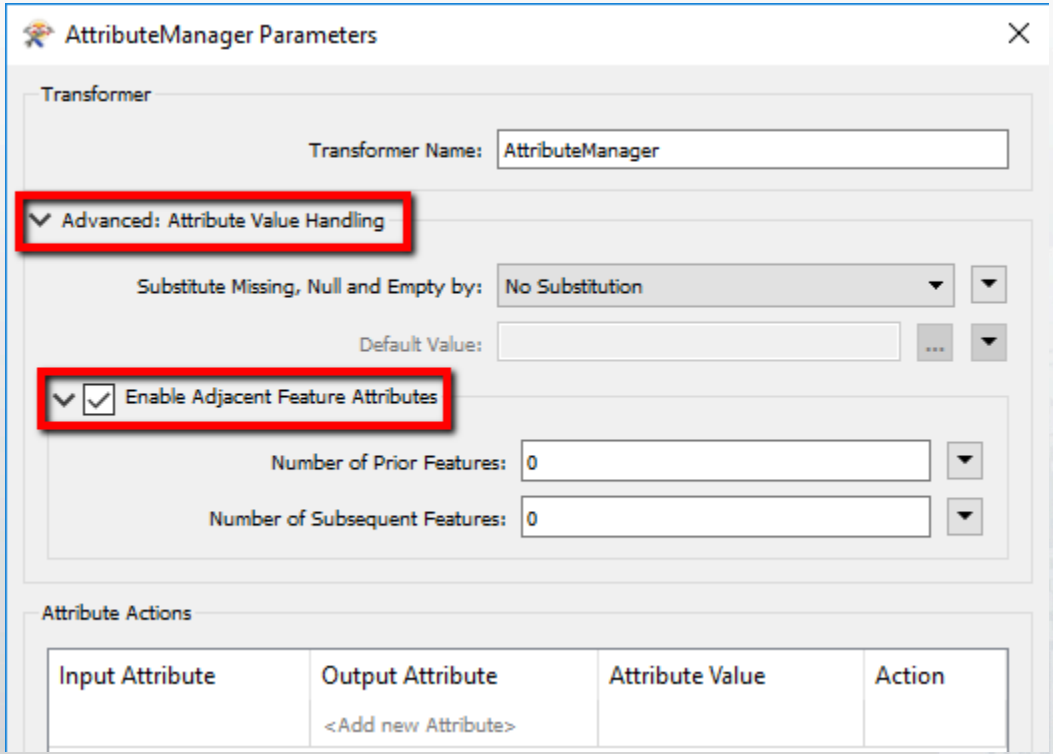
(1) Process the raw Ferry GPS data

Parse Ferry telemetry data-stream for events

- Route event data boundaries are “fuzzy”
- Route events include {ENROUTE | STOPPED | ARRIVED | DOCKED | DEPARTED}
- Requires “look-ahead” / “look-behind” data parsing
- Solution – the FME **AttributeManager/Creator** transformers allow us to access the attributes of adjacent features in a stream of data

(1) Process the actual route data



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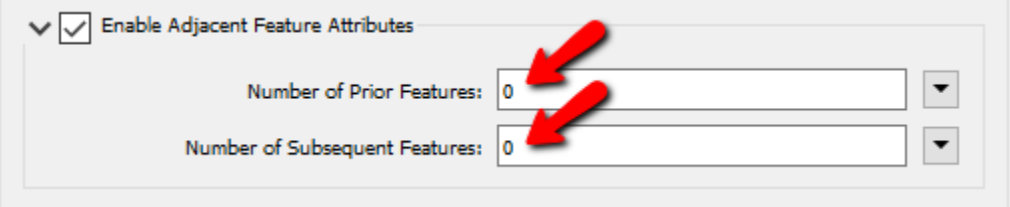
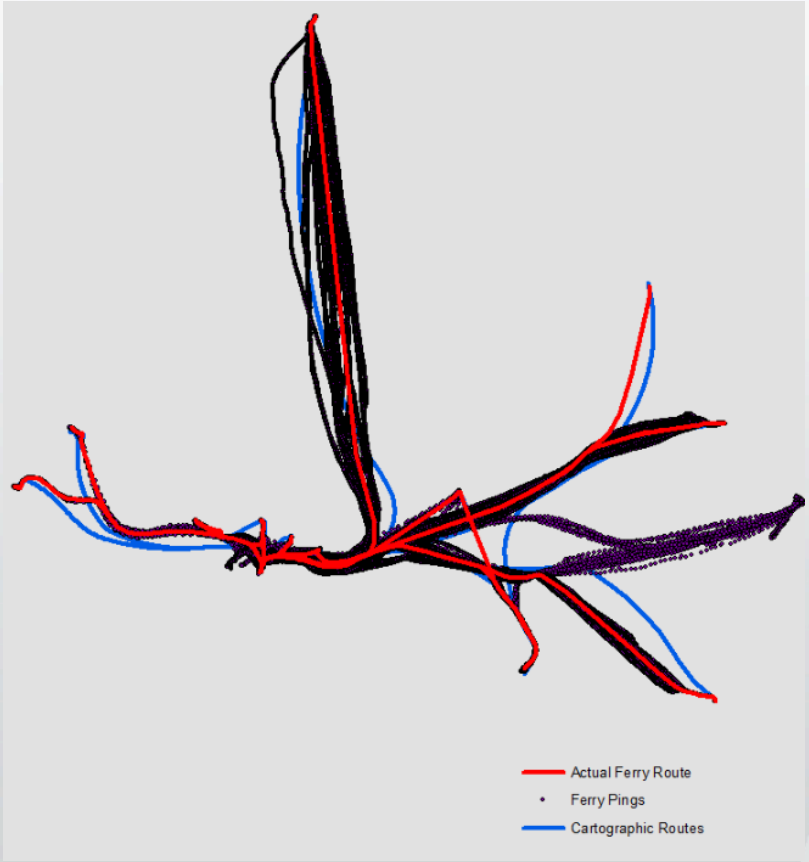


- Prior feature attributes are referenced as feature[-1].AttrName, feature[-2].AttrName
- Subsequent feature attributes are referenced as feature[+1].AttrName, feature[+2].AttrName

(2) Cartographic routes vs Actual routes



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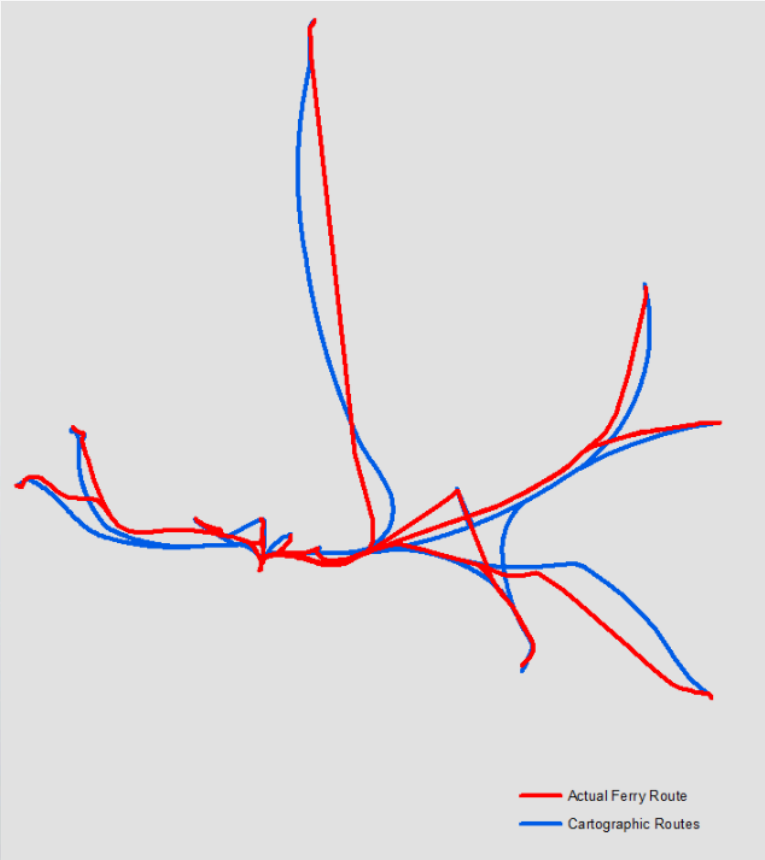
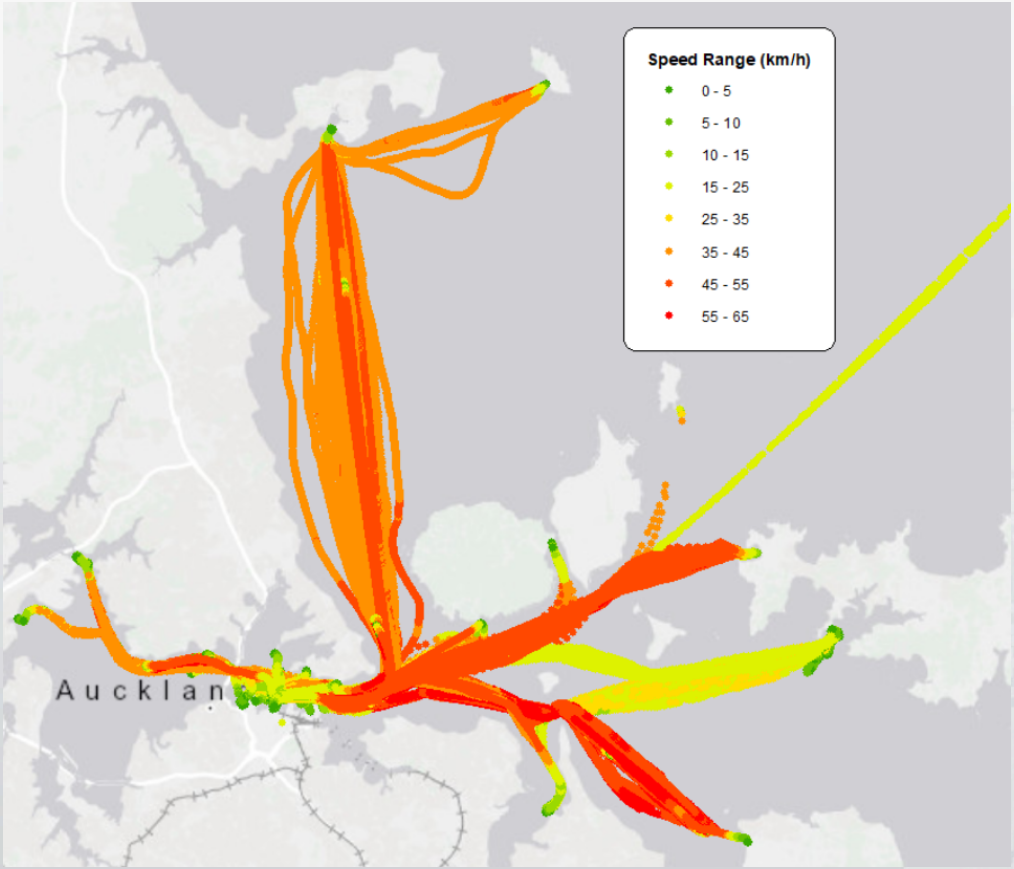


(3) Assumed speed vs Actual speed

Vessel speed is controlled and not uniform …

Downtown Auckland
to Waiheke Island

(3) Assumed speed vs Actual speed



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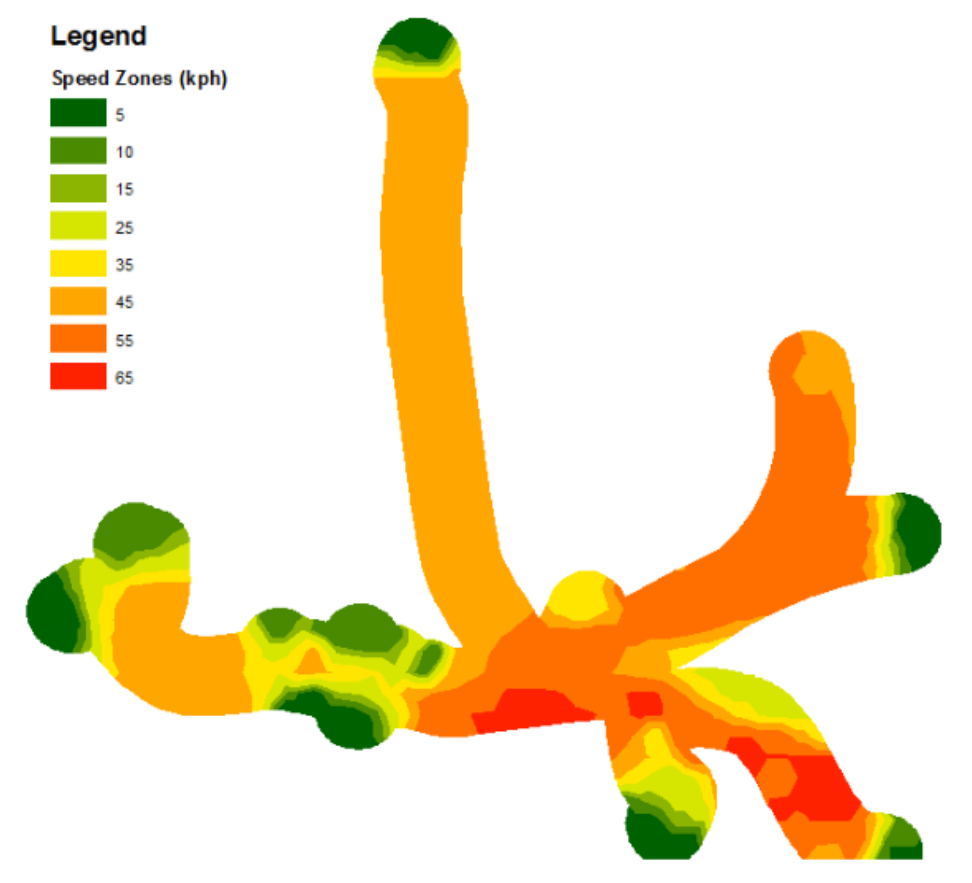
(3) Assumed speed vs Actual speed



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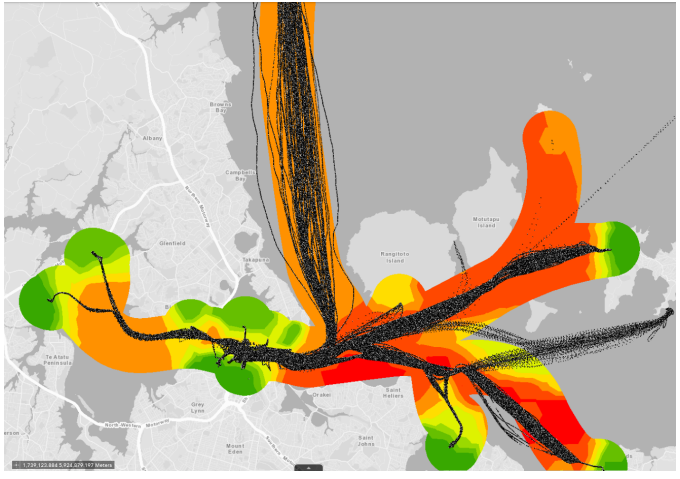
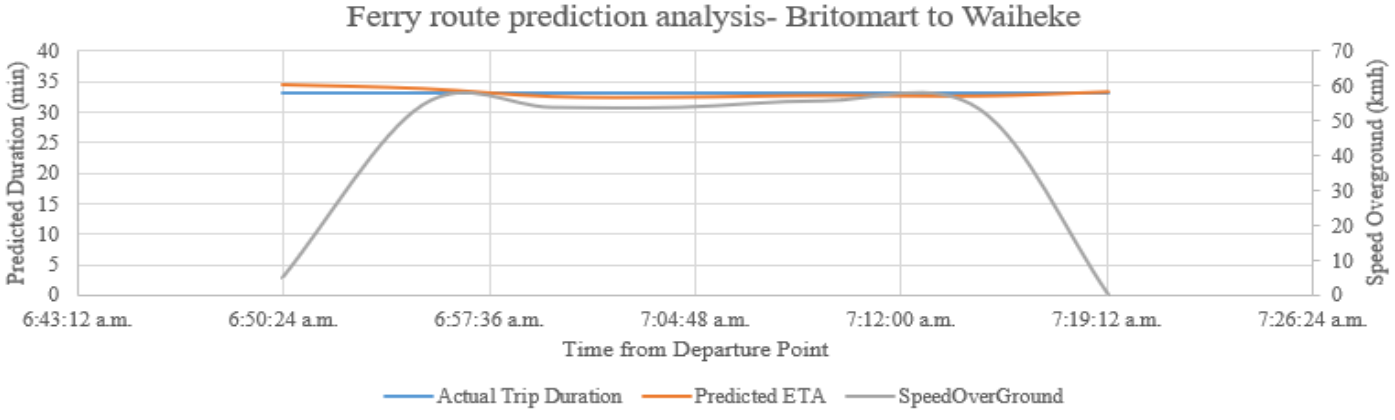
(4) Predicted ETA vs Actual ETA



Actual Time
Predicted Time
Ave Speed



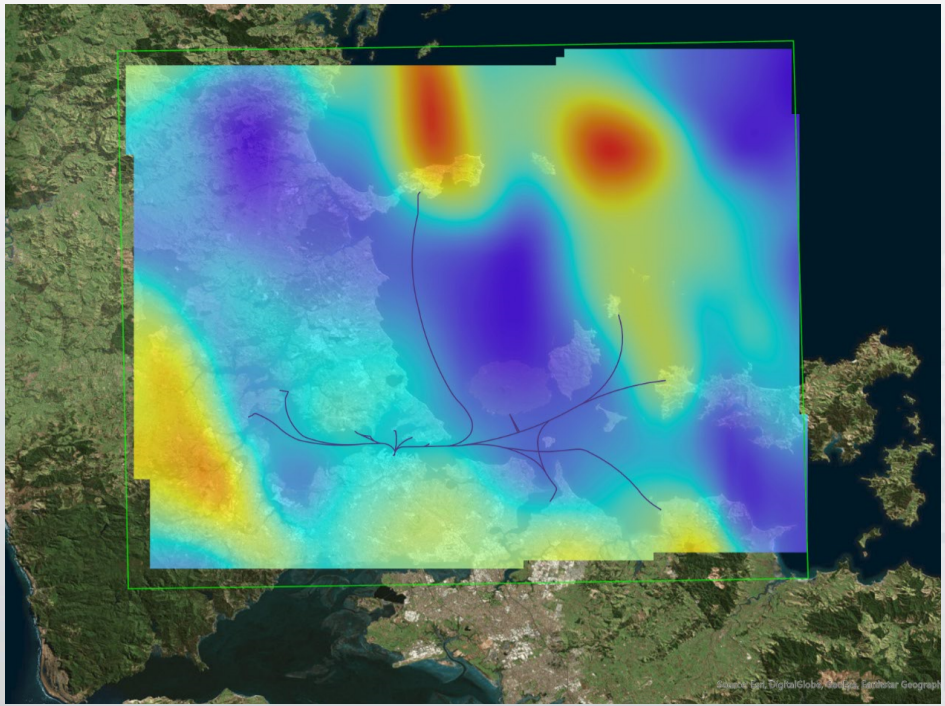
(5) Model Ferry ETA Disruptions

A delayed Ferry = A failed bus connection …

- Connecting bus service delays
- Fog, wind, tide
- Vessel mechanical problems
- Sea traffic – cruise ships, barges
- Ferry berth allocations
- Excess passengers (embarking, disembarking)
- Marine mammals (dolphins)
- Ferry staff training

(5) Model Ferry ETA Disruptors

Model the impact of weather and ocean as a disruptor of Ferry Predicted ETA (Fog, Wind, Tide)



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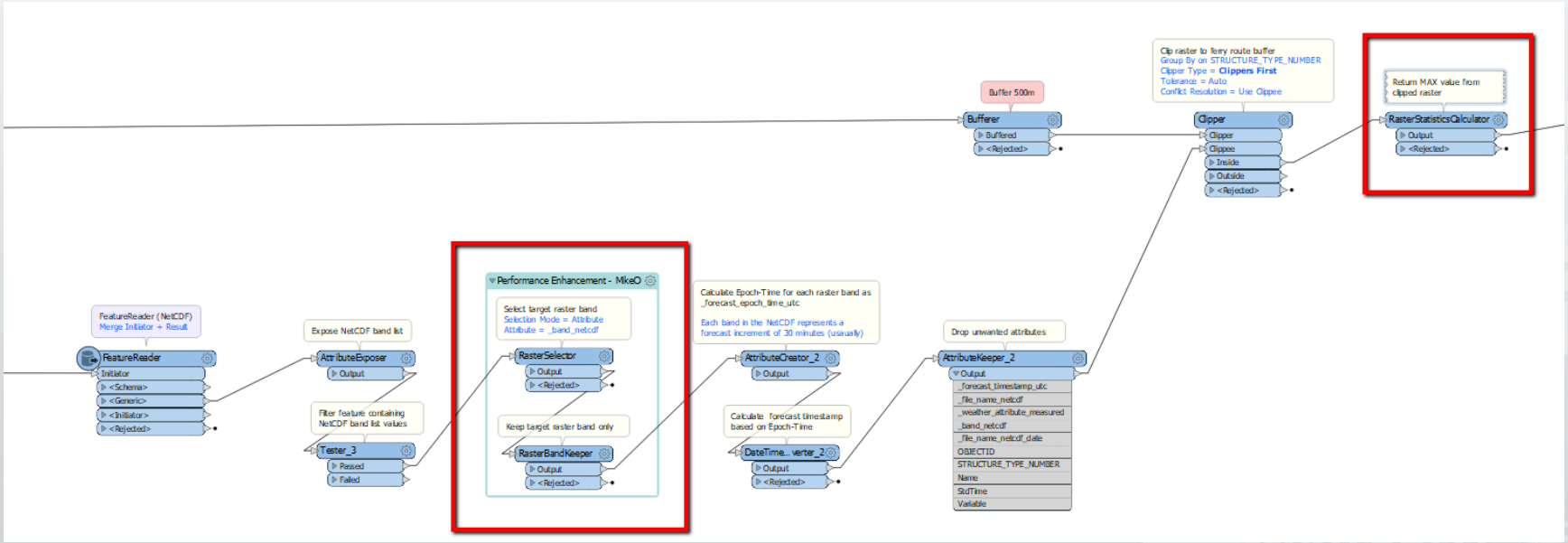
(5) Model Ferry ETA Disruptors

- Buffer time-stamped Ferry routes
- Clip NIWA raster bands (each band = 30 min forecast)
- NIWA rasters measure **29 weather and ocean variables**
- Return MAX(val) on clipped raster for the forecast window



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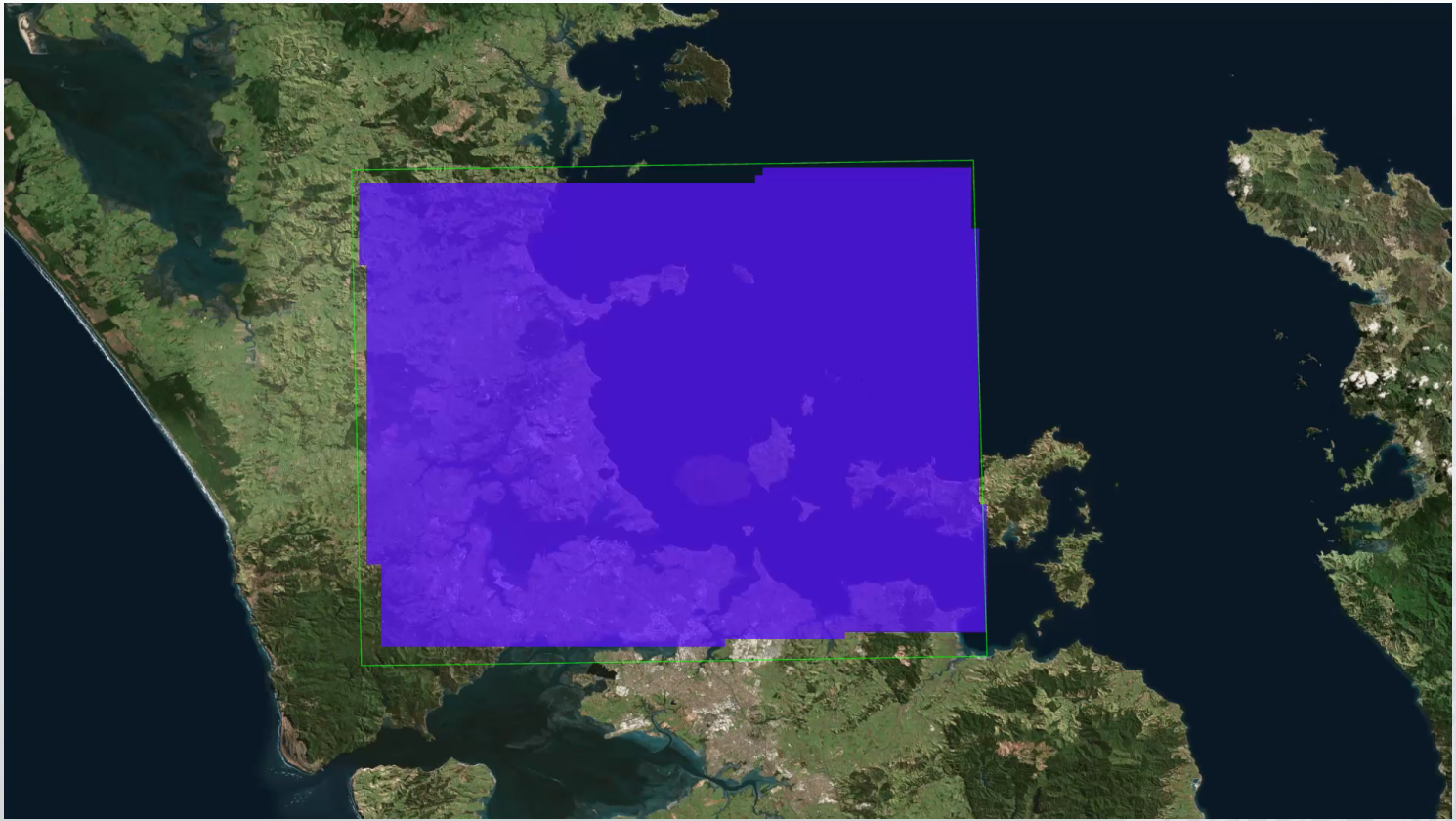
(5) NIWA NetCDF Forecast Rasters …



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(5) The Right Tools for the Job …

Real-time Data Feeds

Apache Kafka

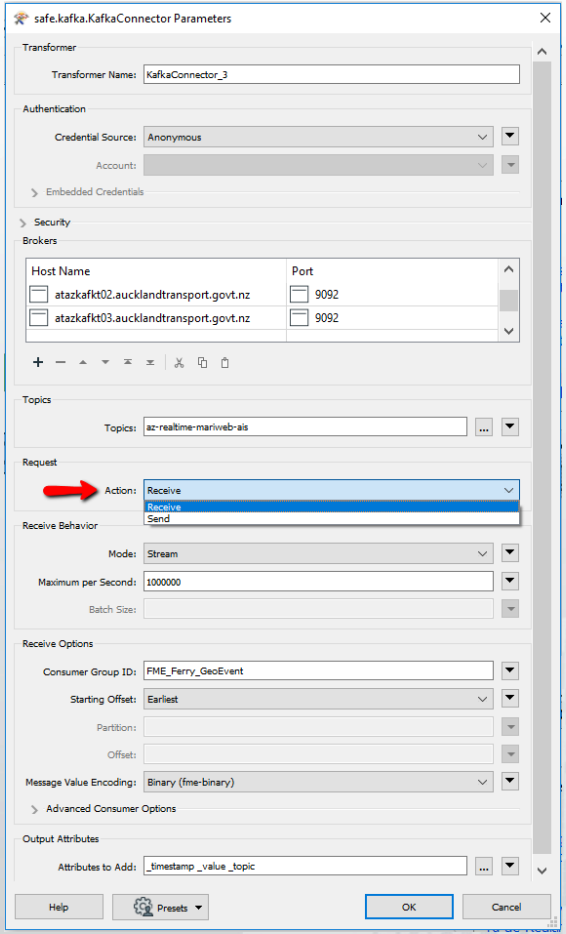
FME KafkaConnector

FME Geo-enrichment

Vertica

Analytics Platform

Ferry Disruptors



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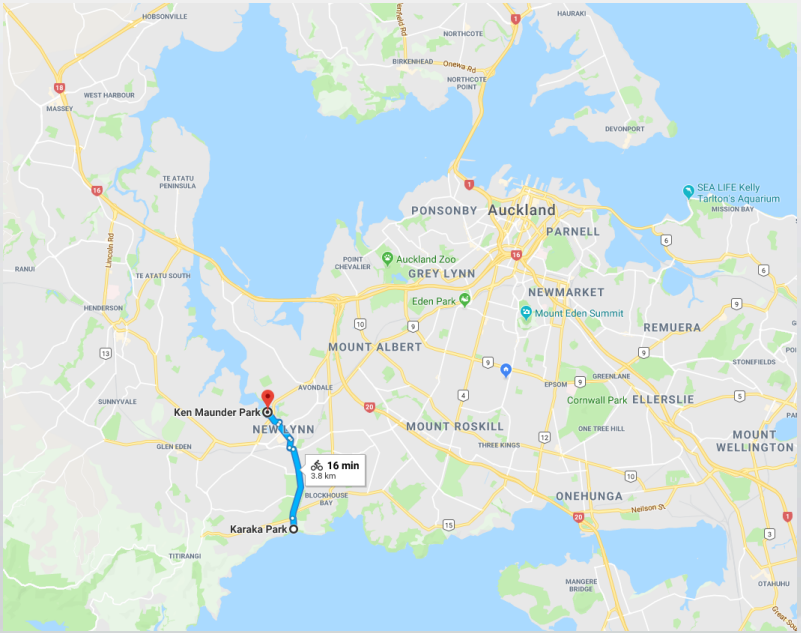
(5) Let's create a Disruptor … ☺

First proposed 100 years ago … build a Ferry canal linking the Waitematā Harbour with the Manukau Harbour via Portage Rd in New Lynn



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Outcomes from ETA ground-truthing …

A "Predictable ETA" Ferry service means …

- ☑ Increased public uptake of Ferries
- ☑ Offsets demands on the Road Transport Network
- ☑ Improved multi-modal transport interoperability
- ☑ Real-time notifications when disruptions occur
- ☑ An improved customer PT experience
- ☑ The Auckland Water Transport Network will grow

THANK YOU!

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Auckland Transport Ltd |
https://at.govt.nz/