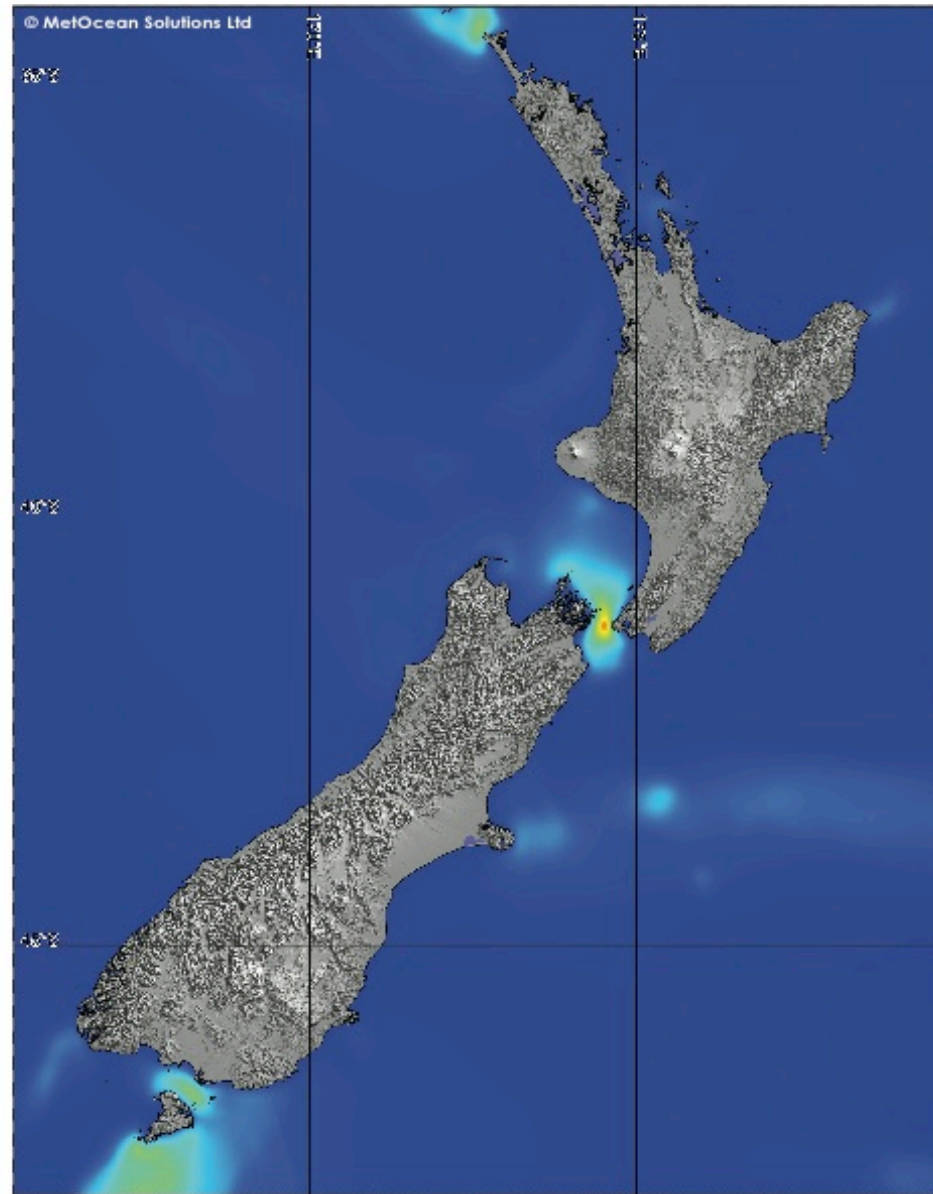


New Zealand Tidal Power

Curtis Wilhelm

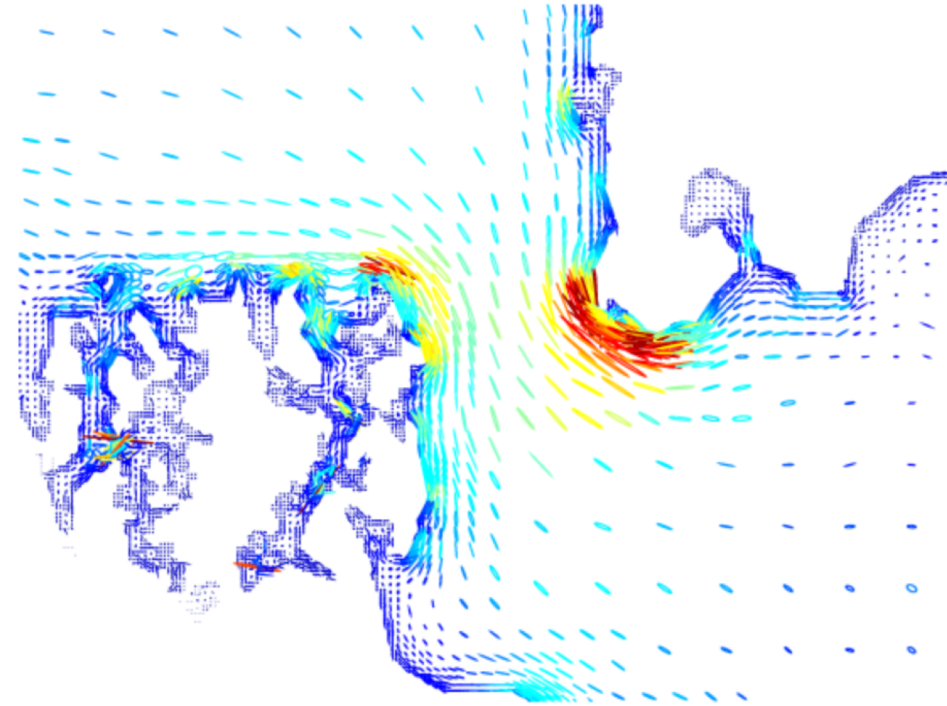
Feasible Area

- Cook Strait
- Kaipara Harbour
- Manapouri
- Manukau Harbour
- Hokianga Harbour



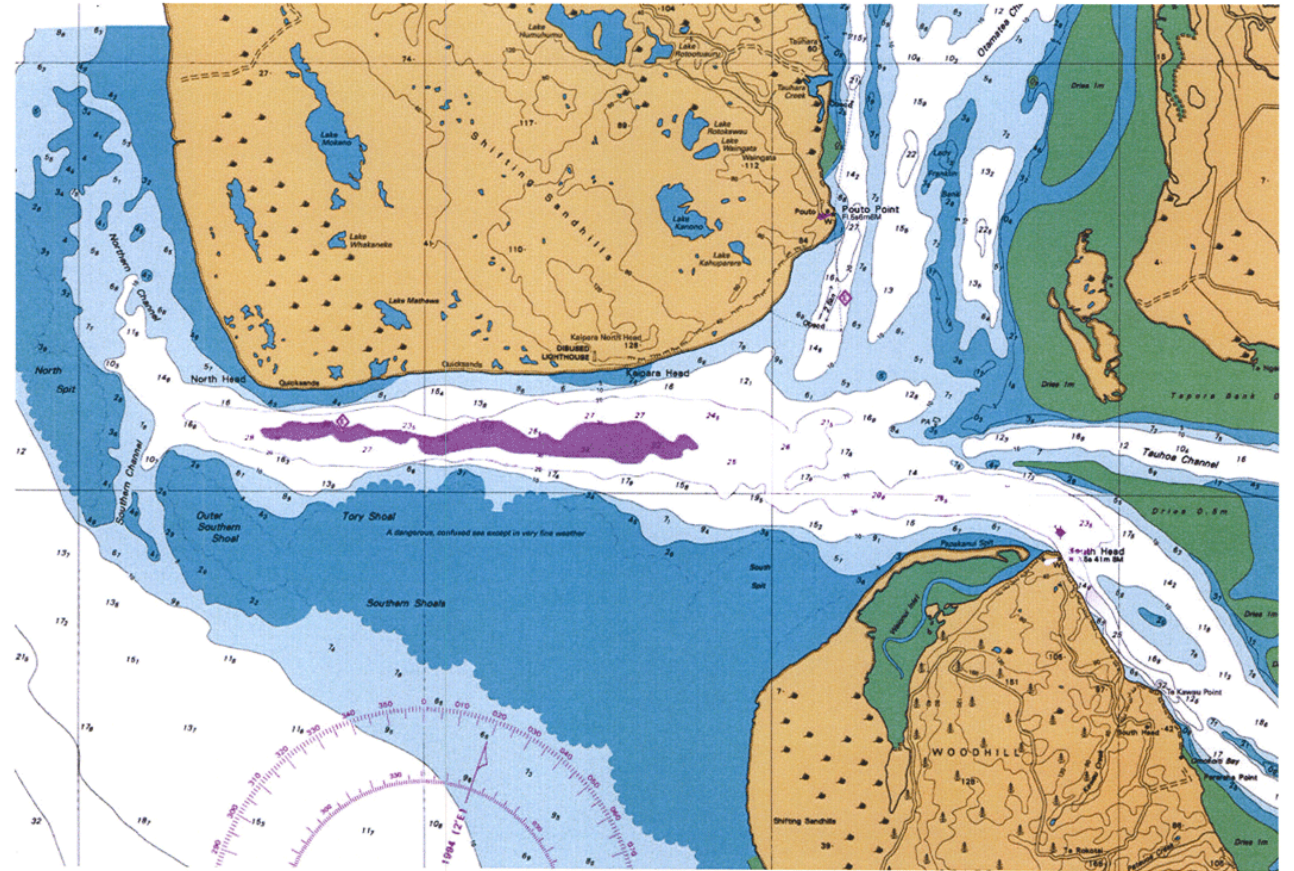
Cook Strait

- ▶ Some of the strongest tidal flows
 - ▶ 5 knots
- ▶ 1 Tidal stream turbine
 - ▶ \$10 million
- ▶ Enough tidal movement in the Cook Strait to generate 12 GW of power
 - ▶ 1.5 x New Zealand's current requirements



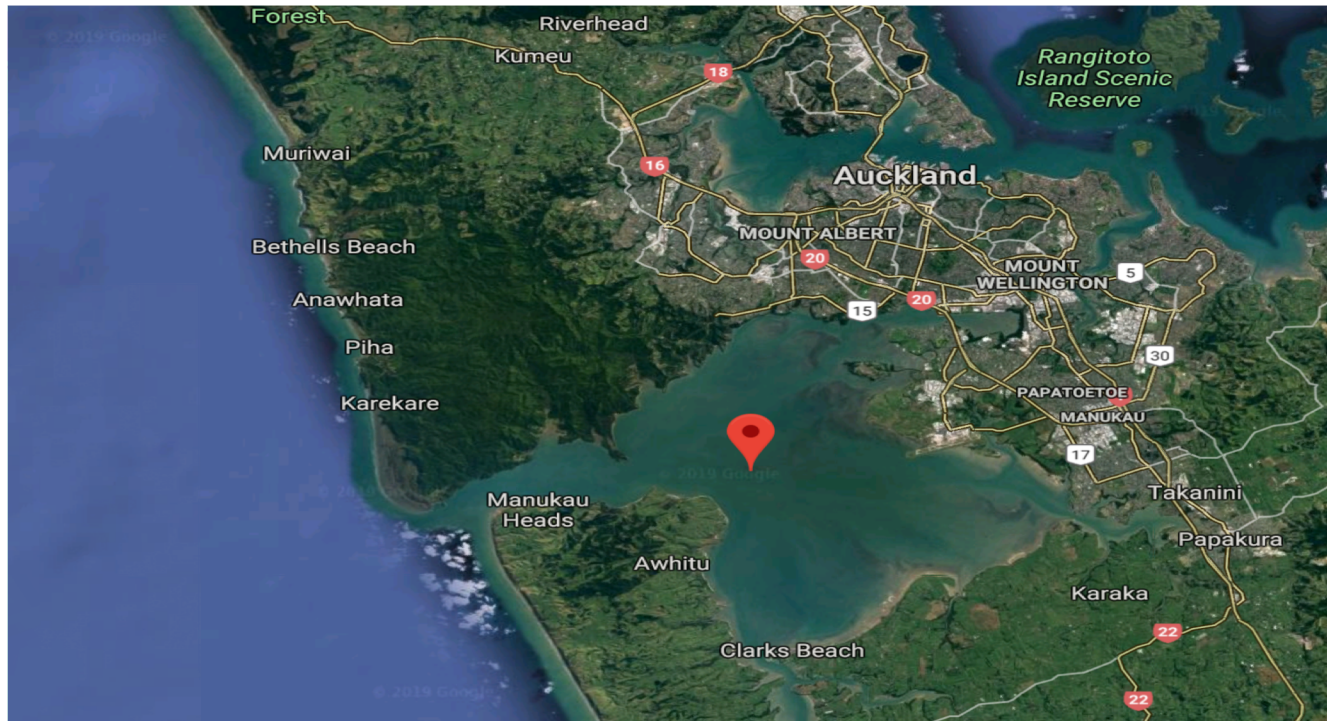
Kaipara Harbour

- ▶ Could potentially power 250,000 homes
- ▶ 200 Turbines
 - ▶ 1.2 MW max
 - ▶ 0.75 MW average
- ▶ Harbour's current is 9km/h
- ▶ Cost Estimate: NZD \$600 million
- ▶ Issues:
 - ▶ Government funding
 - ▶ Concerns over effects on marine environment
 - ▶ Dolphins
 - ▶ Fish stocks



Manukau and Hokianga Harbour

- ▶ Each Harbour produces up to 6 knots of tidal flows
- ▶ Tidal flows up to 100,000 cubic meters per second
- ▶ These tidal volumes are 12 times greater than the largest New Zealand Rivers



Constraints

- ▶ Environmental Concerns
- ▶ Corrosion
- ▶ Fouling
- ▶ Cost

Environmental Concerns

Tidal Turbines

- ▶ Blades striking marine life
- ▶ High frequency sounds can effect dolphins
- ▶ Degrade water quality by build up of sediment

Tidal Barrage

- ▶ Could change the shoreline
- ▶ Could result in depletion of salt water
- ▶ Migrating fish can be blocked off of their areas
- ▶ High frequency sounds
- ▶ Blocks shipping lanes

Corrosion

- ▶ Salt water can cause corrosion in some of the metal parts
- ▶ Higher cost materials can reduce corrosion damage
- ▶ Mechanical fluids, such as lubricants, can leak out, which may be harmful to the marine life nearby.

Fouling

- ▶ The growth of marine organisms on the surface of a structure underwater
- ▶ Can cause decline in power production



Cost

- ▶ Cost is the main reason for lack of tidal power
- ▶ Very high initial cost
- ▶ Costs will go down with more advanced technology
- ▶ Estimated a 20 turbine system cost:
 - ▶ amortized annual cost of around \$105 million USD
 - ▶ That would be 19.7 cents USD per KWh
 - ▶ More than nuclear plants
 - ▶ Larger systems can be cheaper