Crest Energy

Kaipara Harbour

Marine Turbine Project

RMLA (AUCKLAND BRANCH) SEMINAR

November 2009

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- Operation of marine turbines
- Project RMA History
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- Turbine Deployment Areas
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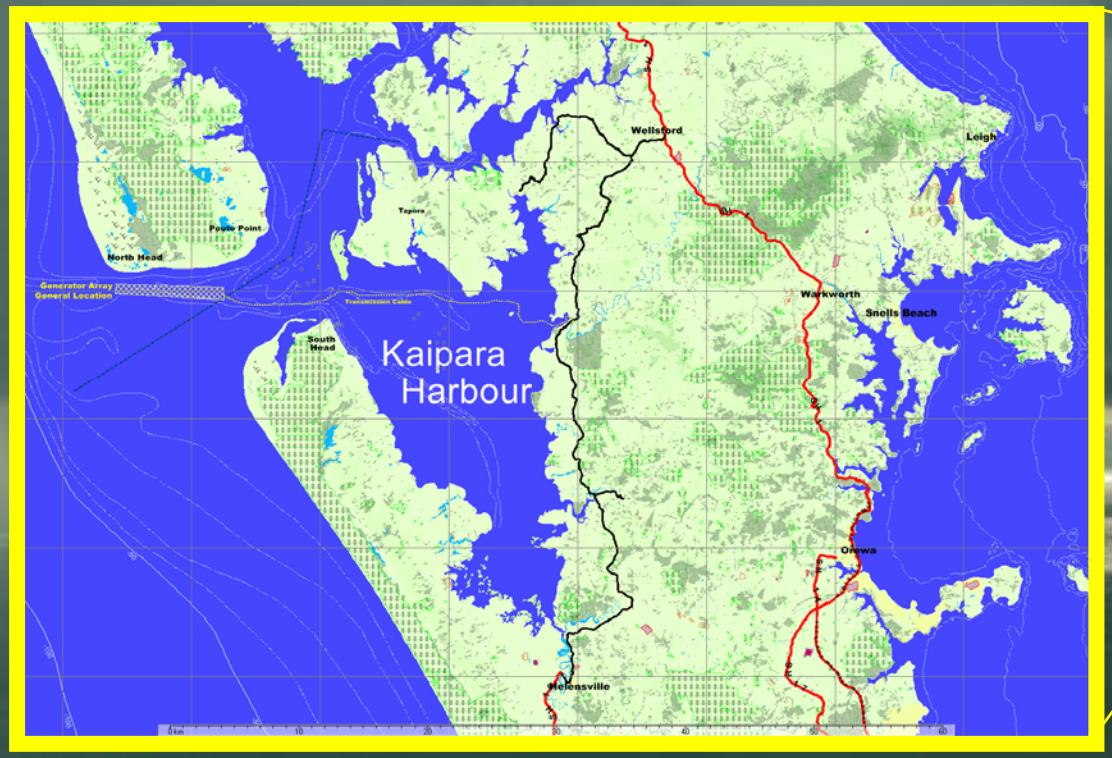
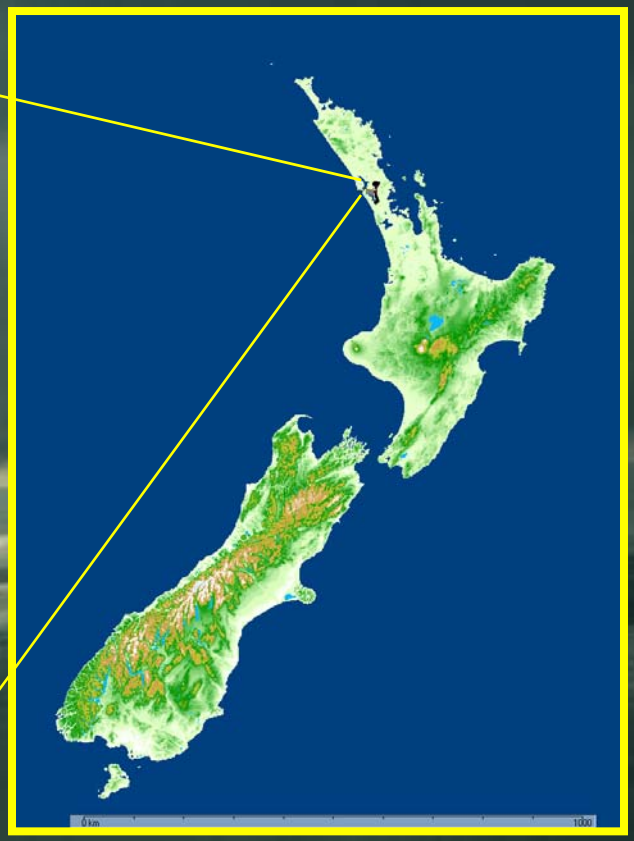
Location


Wellsford
Leigh
Tapora
Pearle Point
North Head
Generator Array General Location
Transmission Cable
Warkworth
Snells Beach
South Head
Kaipara Harbour
Orewa
Helensville



Why the Kaipara Harbour?

- Tidal range 2.68 m – 1.52 m
- Tidal compartment 1,990 million m^3 - 1,130 million m^3
- Surface area total 947 km^2, perimeter 612 km
- Swells inside bar typically 1.5 to 2.5 m in height from SW and W

	Millions of cubic metres of water per tide	Average current metres per second
Kaipara	1,990	1.12
Manukau	918	0.92
Hokianga	228	0.81
Whangarei	164	0.54
Raglan	46	0.59

- Very large harbour – using only part of the area
- Bar at entrance prevents use by deep draft vessels (5m limit)
- Strategically important location for Northland power supply
- Limited commercial activity

Marine Turbines

Opted for Vane Turbines to avoid collision risk

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Project History

2005	Jul	Project commences
2006	Jul	First Applications lodged – NRC ARC RDC
2007	Jul	Revised application – NRC
2008	May	NRC Hearing
	May	$1.85 million NZMEDF Grant
	Aug	NRC Decision in favour
	Sep	Appeals lodged
2009	Jun	Environment Court

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Project Development

- Obtain consents

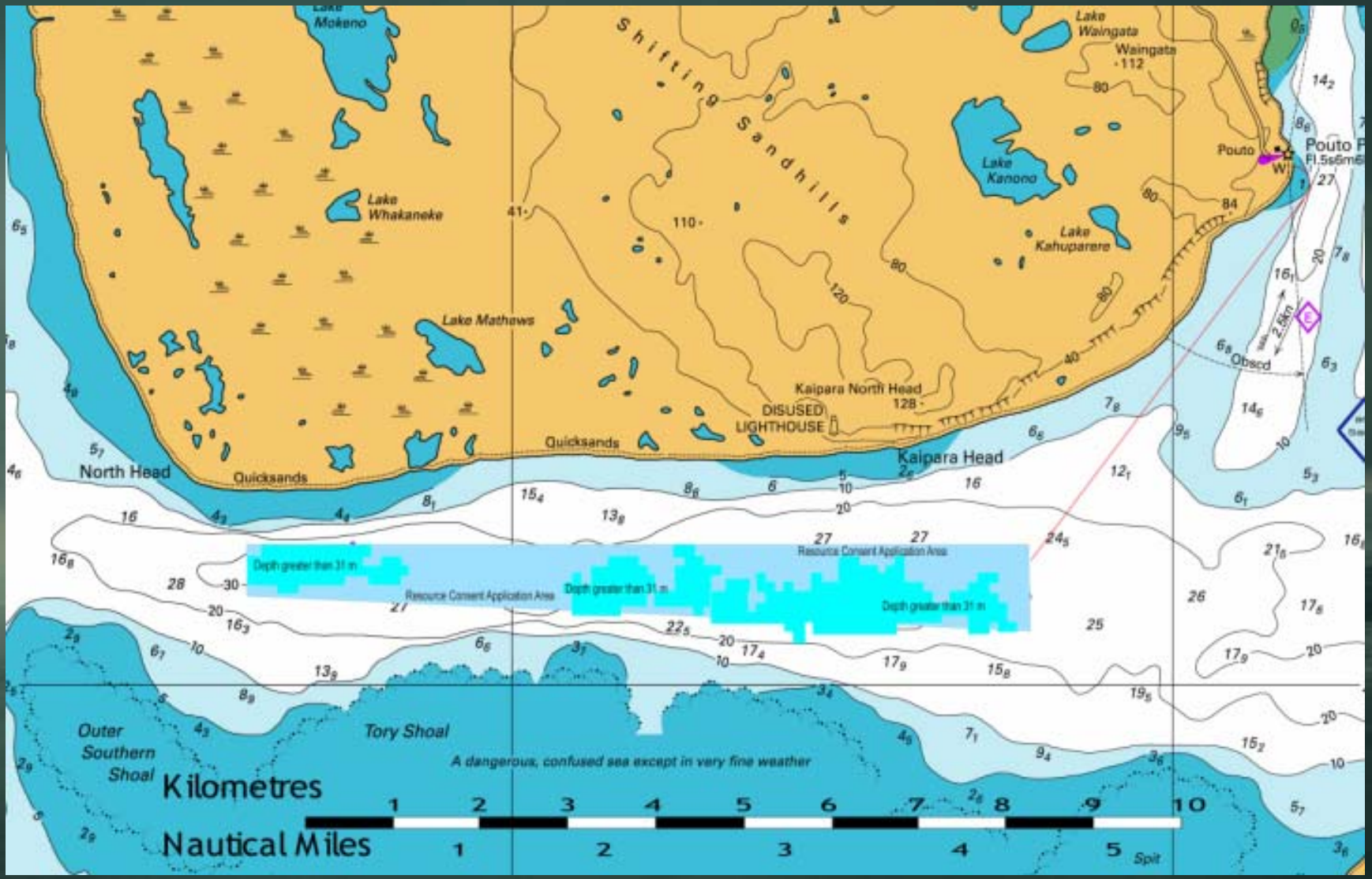
- Baseline Monitoring $2^{+?}$ yrs
- Stage 1 up to 20 units 1-2 yrs
- Stage 2 40 units 2–4 yrs
- Stage 3 80 units 4-6 yrs
- Stage 4 200 units 6+ yrs

- Adaptive Management Basis

- Transition from one stage to next based on outcome of monitoring - subject s128 Review

Turbine locations

Original Application Area



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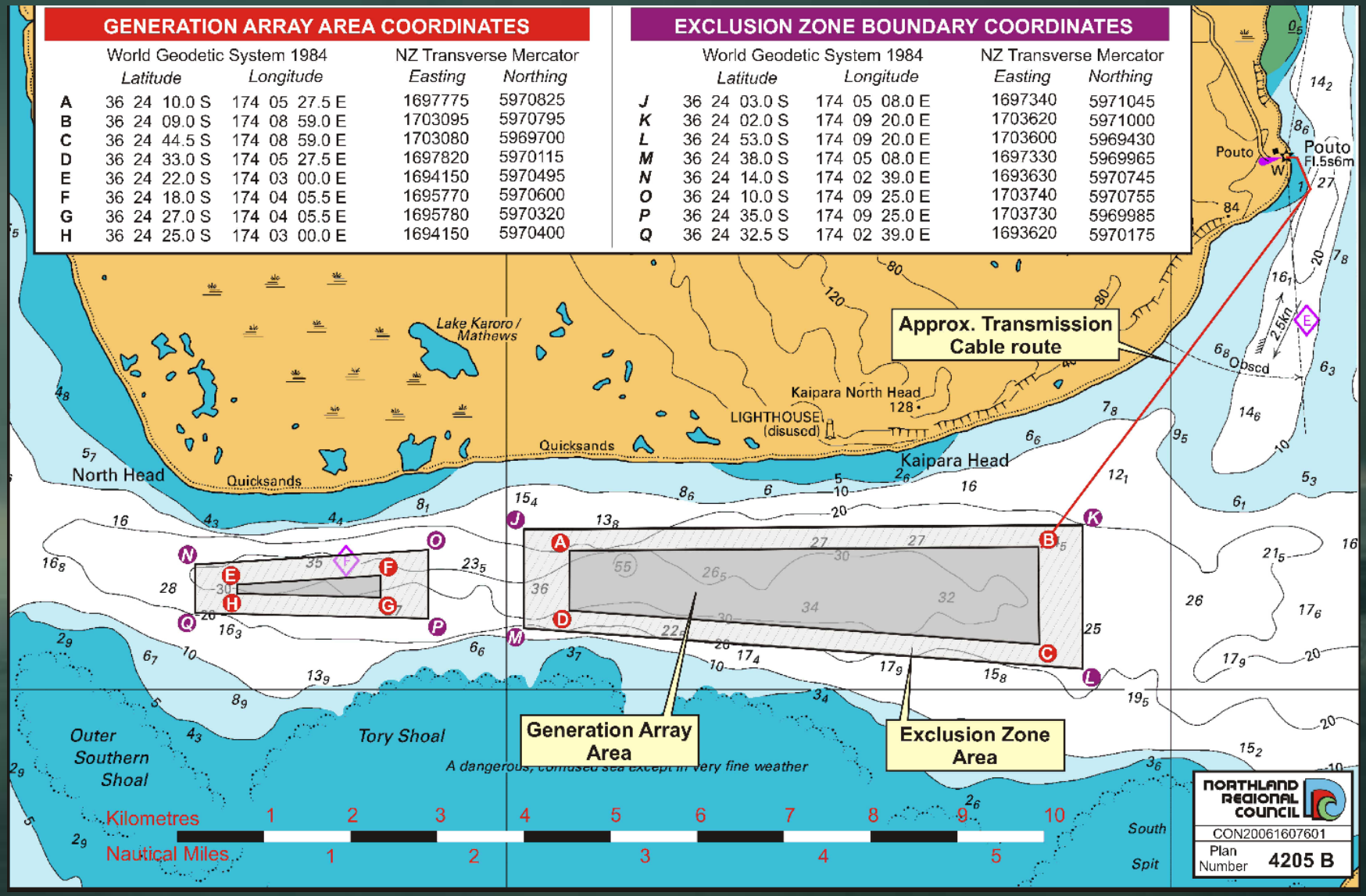
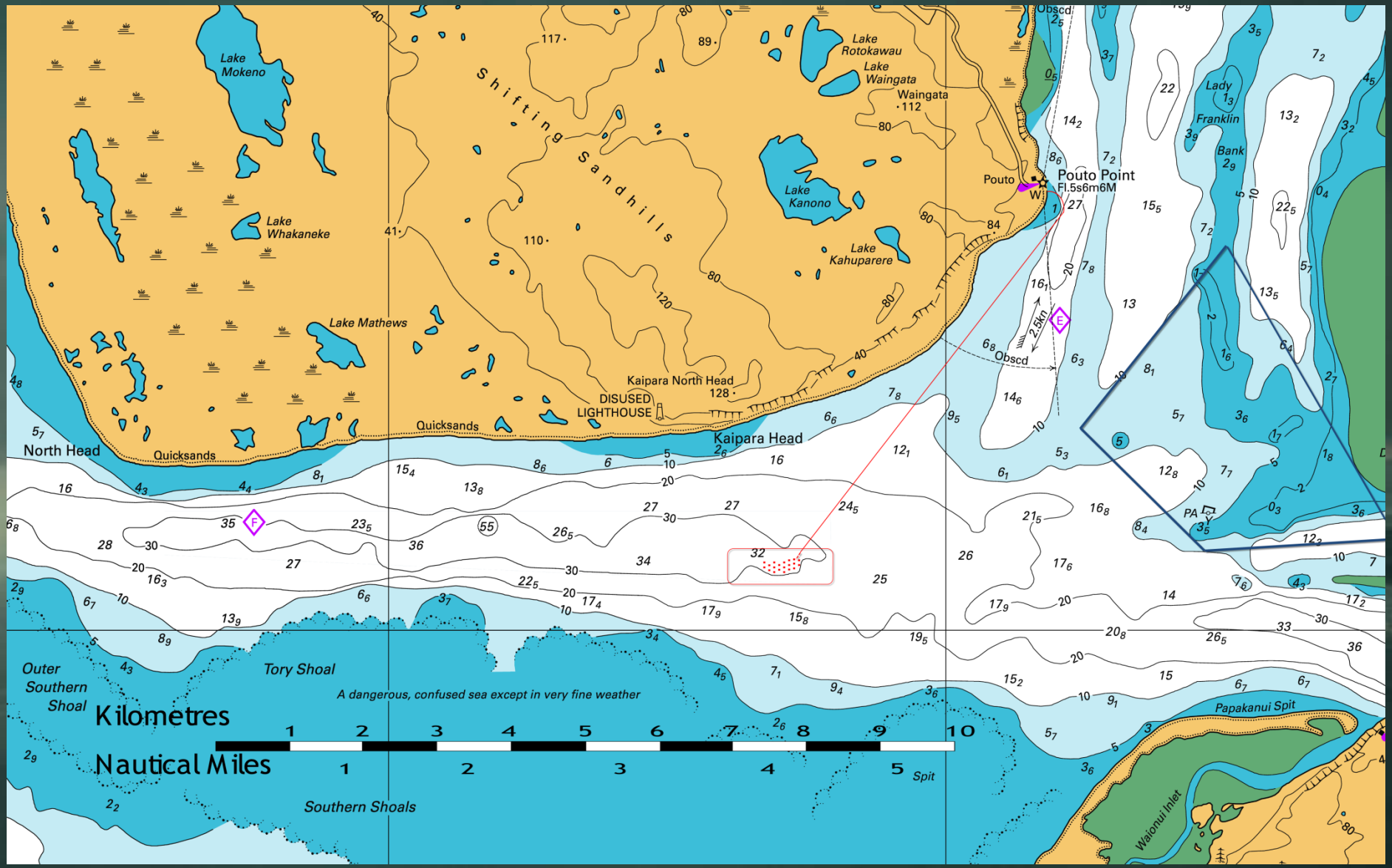
Turbine Areas – NRC



Includes provision for navigational buffer zones – reduces potential array area

Stage 1: Eastern Array Option



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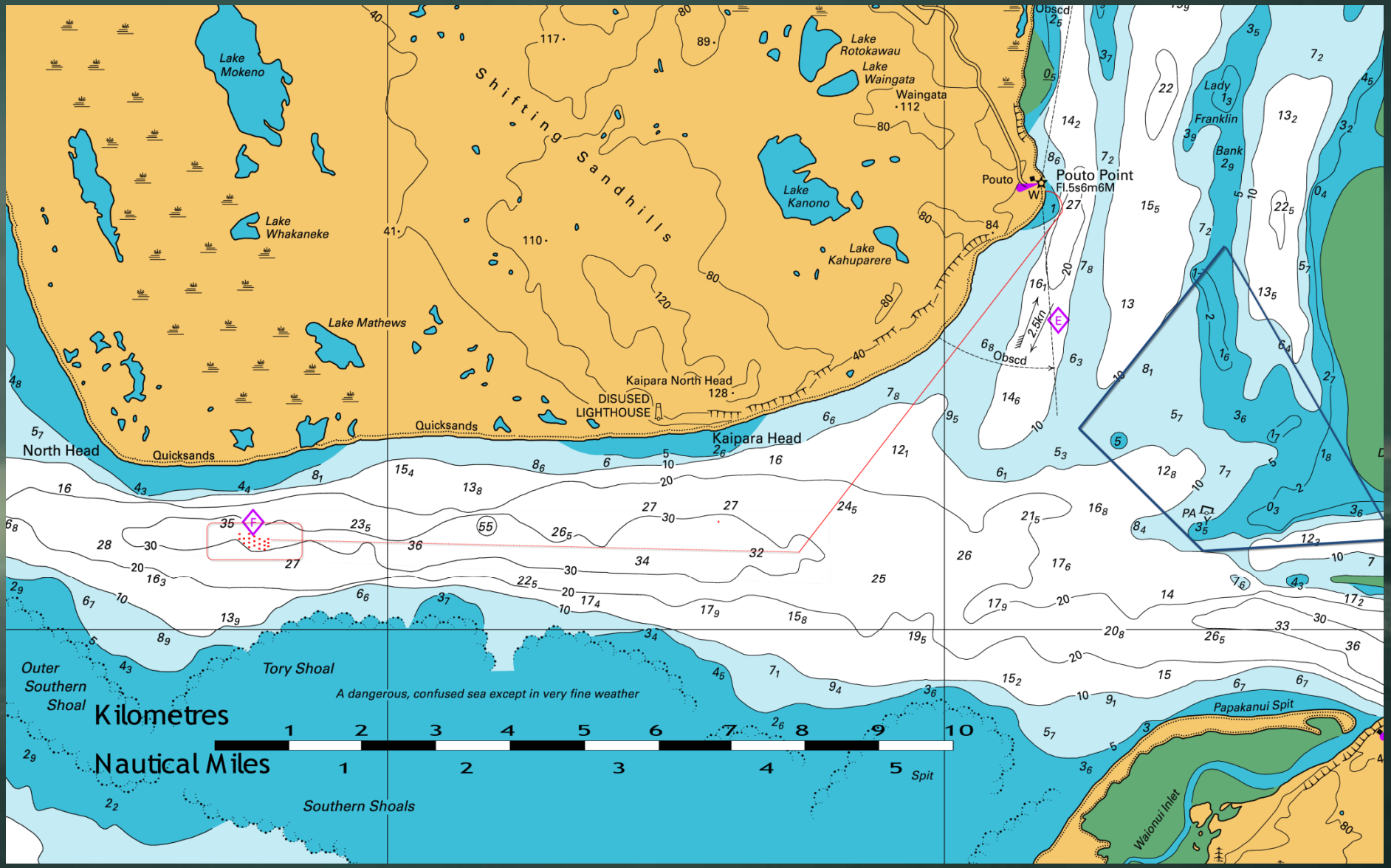
Stage 1: Western Array Option



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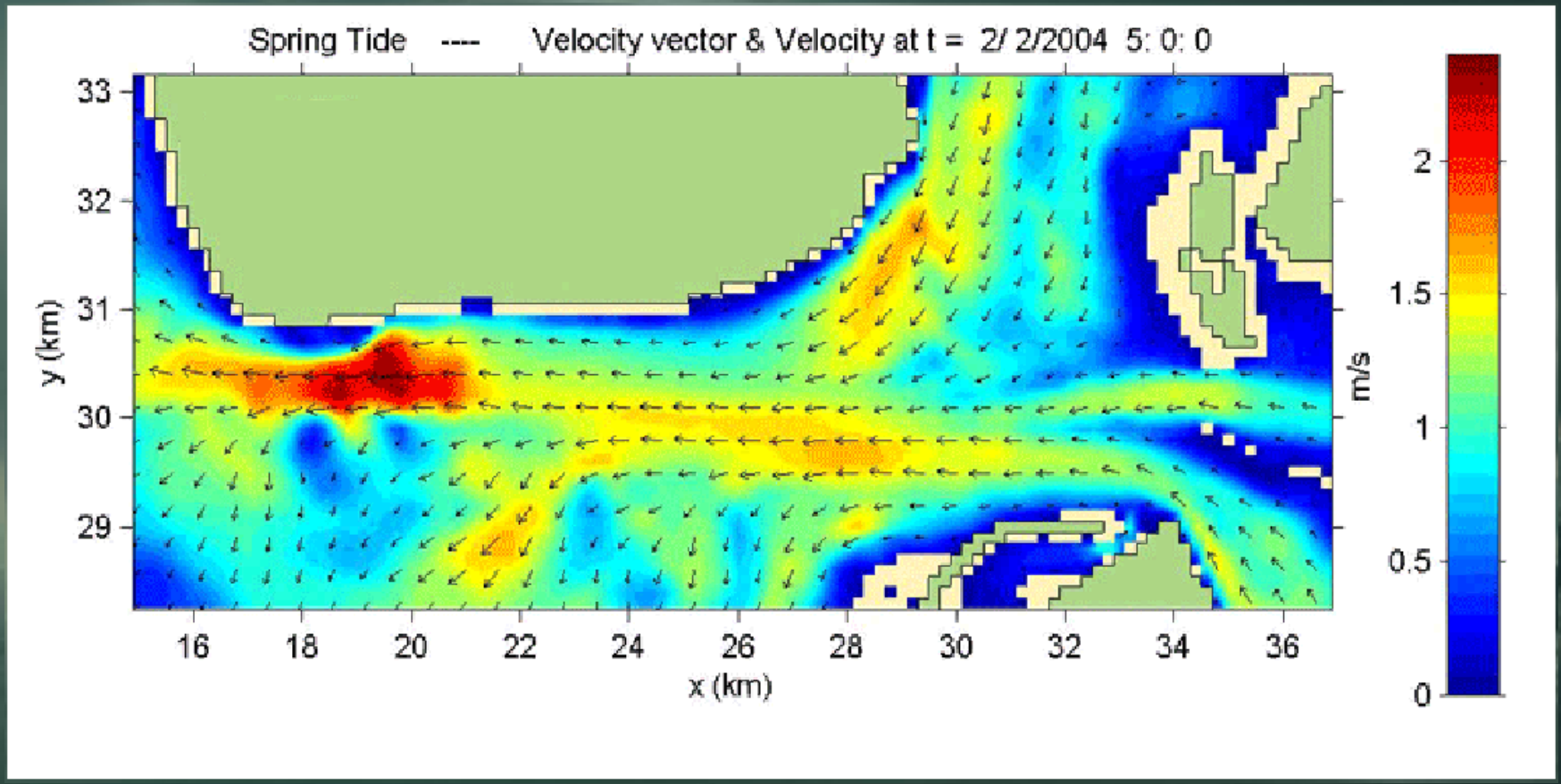
Main Technical Issues

- Hydrology and sediment issues
- Collision Risk - Marine mammals, fish
- Navigation and Anchoring
- Noise effects on mammals and fish
- Fishing

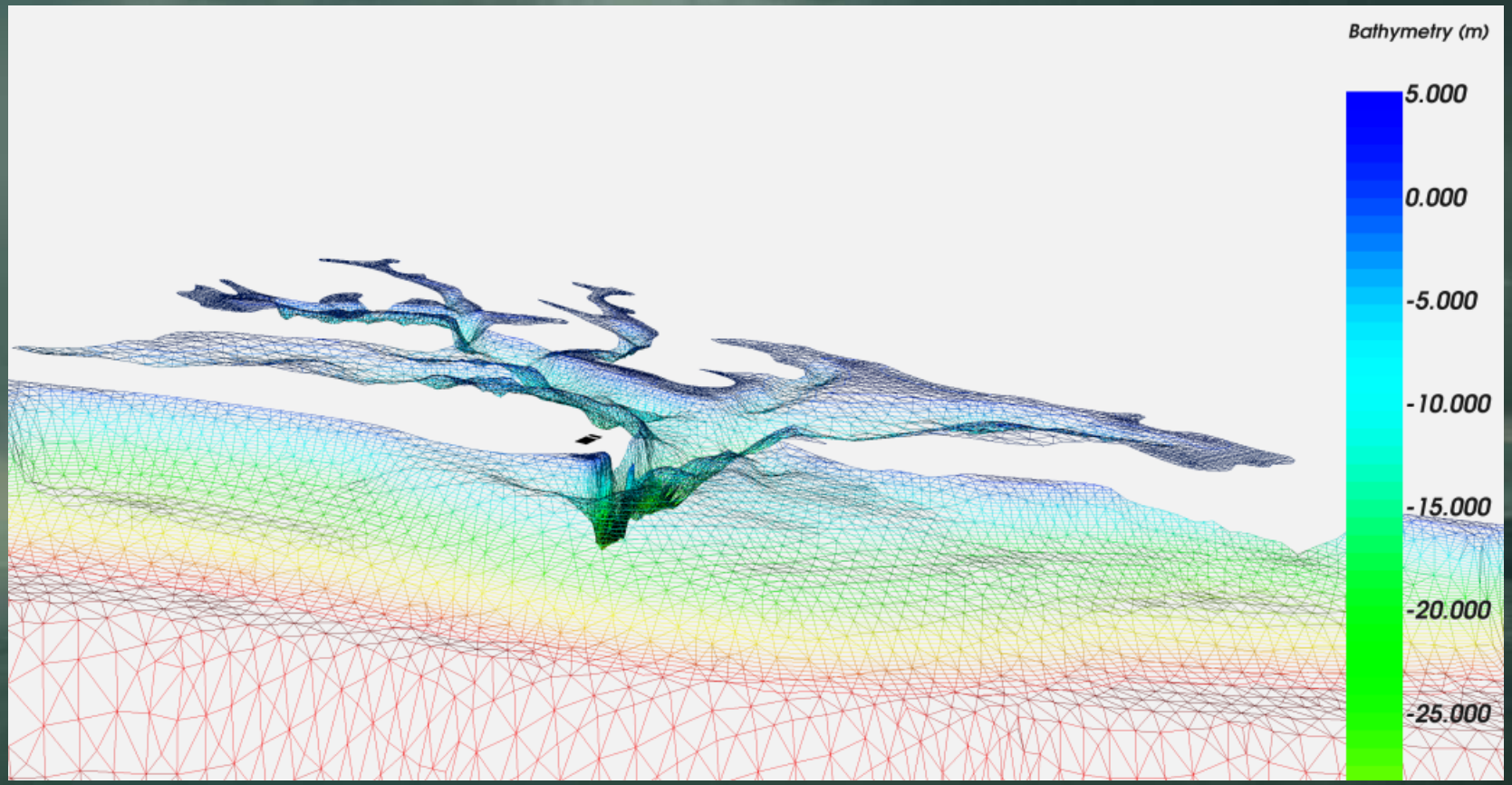
Currents



Undertook extensive tidal flow measurements – for modelling

Peak velocity exceeds 2.5 m/s (5 knots) at entrance

Modelling Turbine Effects



Developed model to predict changes in velocity relating to turbine presence
Extrapolate findings to potential effects on sediment dynamics

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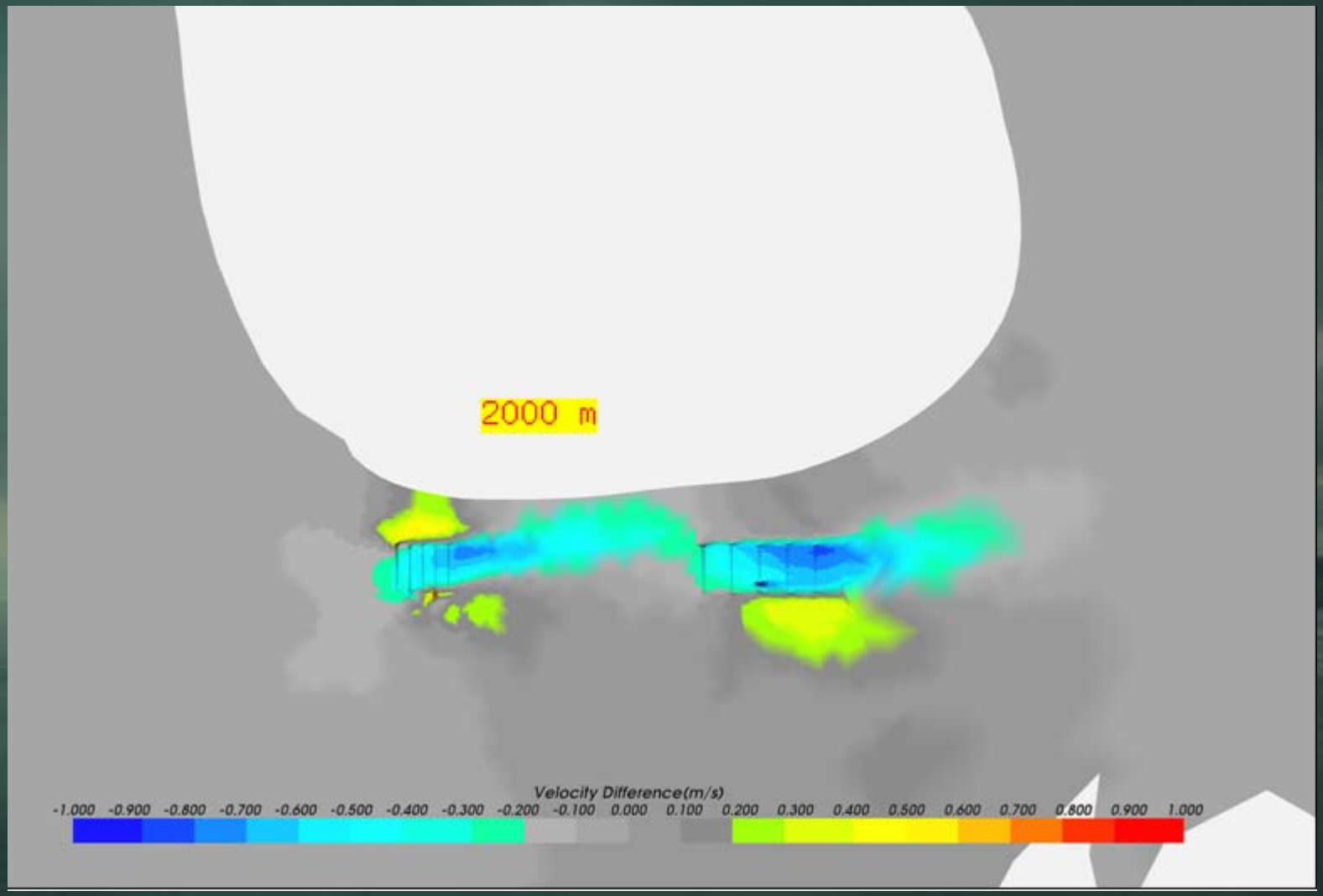
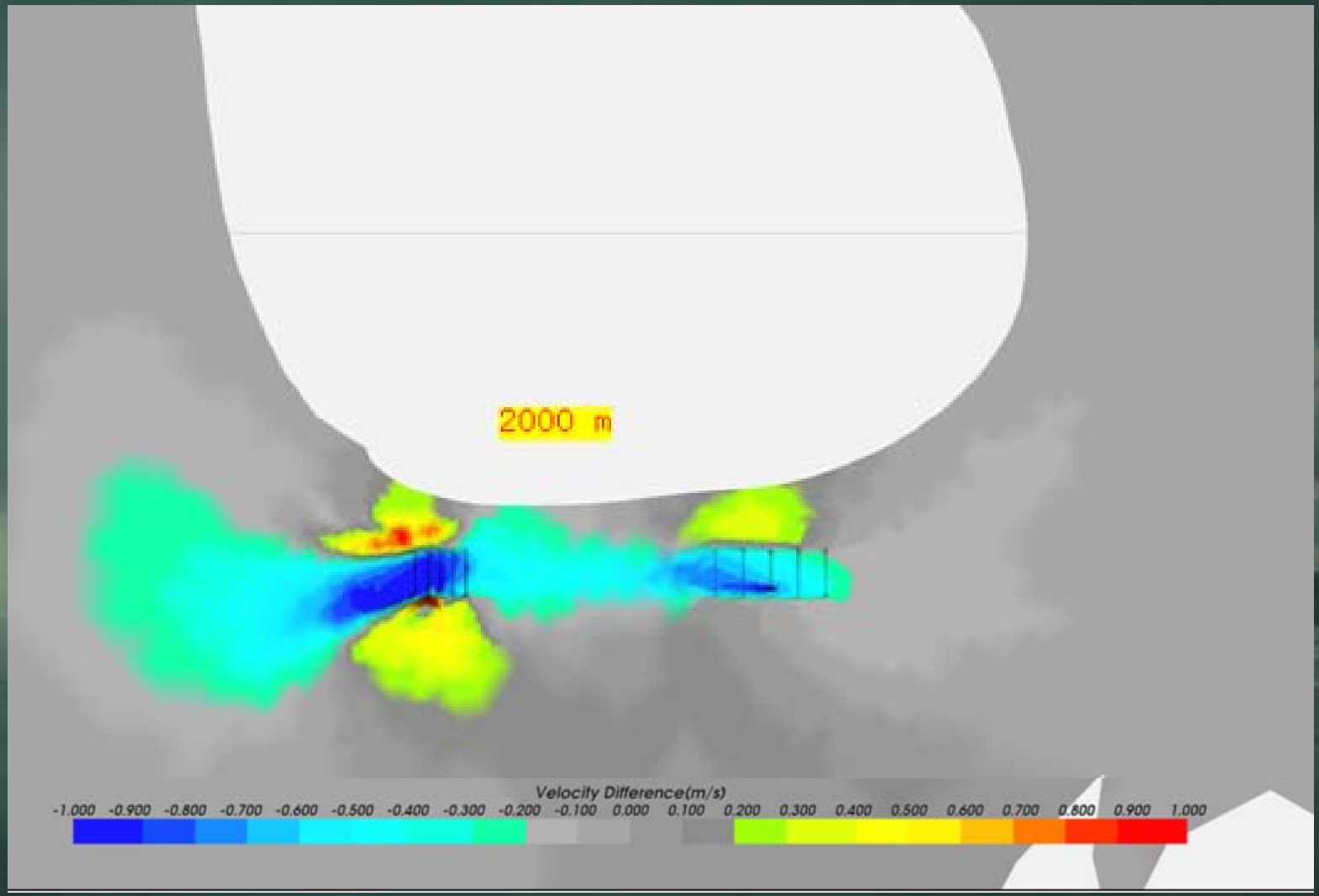
Modelling Turbine Effects



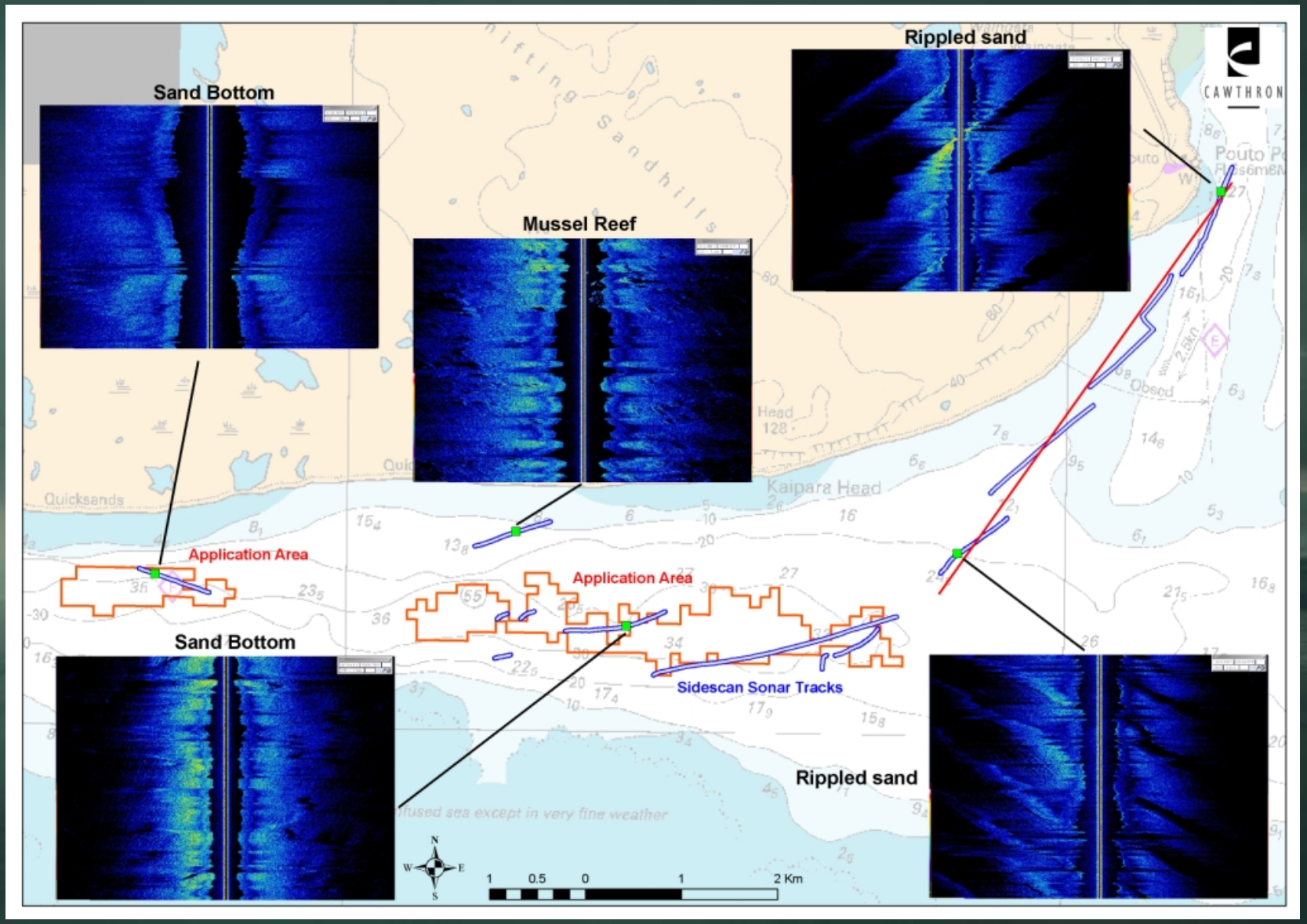
Ebb flow differences at peak flow for 100+100 turbine case
Velocity change for 200 units is small - for 20 units will be very small

Modelling Turbine Effects



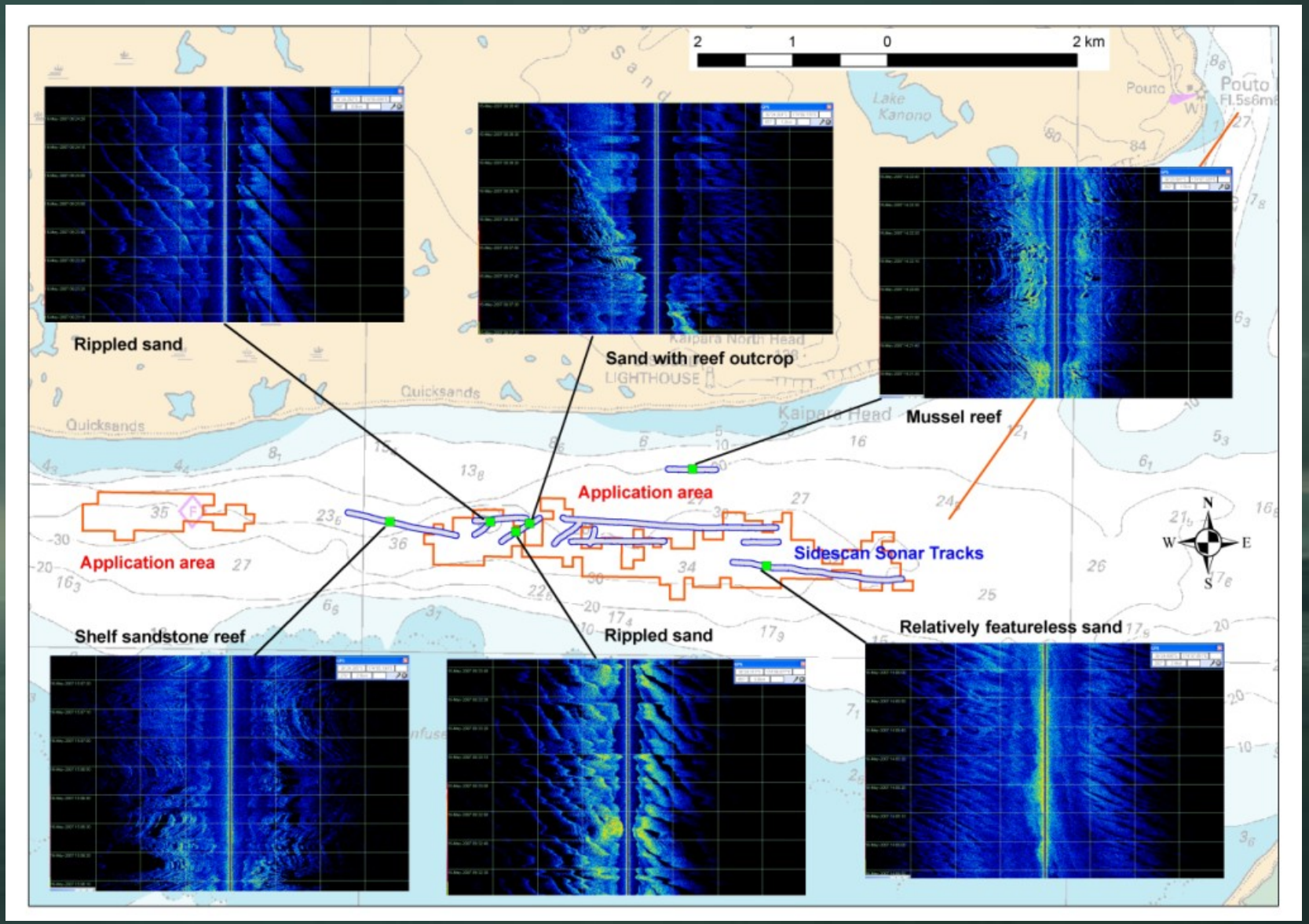
Flood flow differences at peak flow for 100+100 turbine case
Velocity change for 200 units is small - for 20 units will be very small

Seabed



Sidescan sonar assessment of seabed for turbine deployment

Seabed



Sidescan sonar assessment of seabed for turbine deployment

Noise

Concerns raised about possible effects of noise on marine life including marine mammals

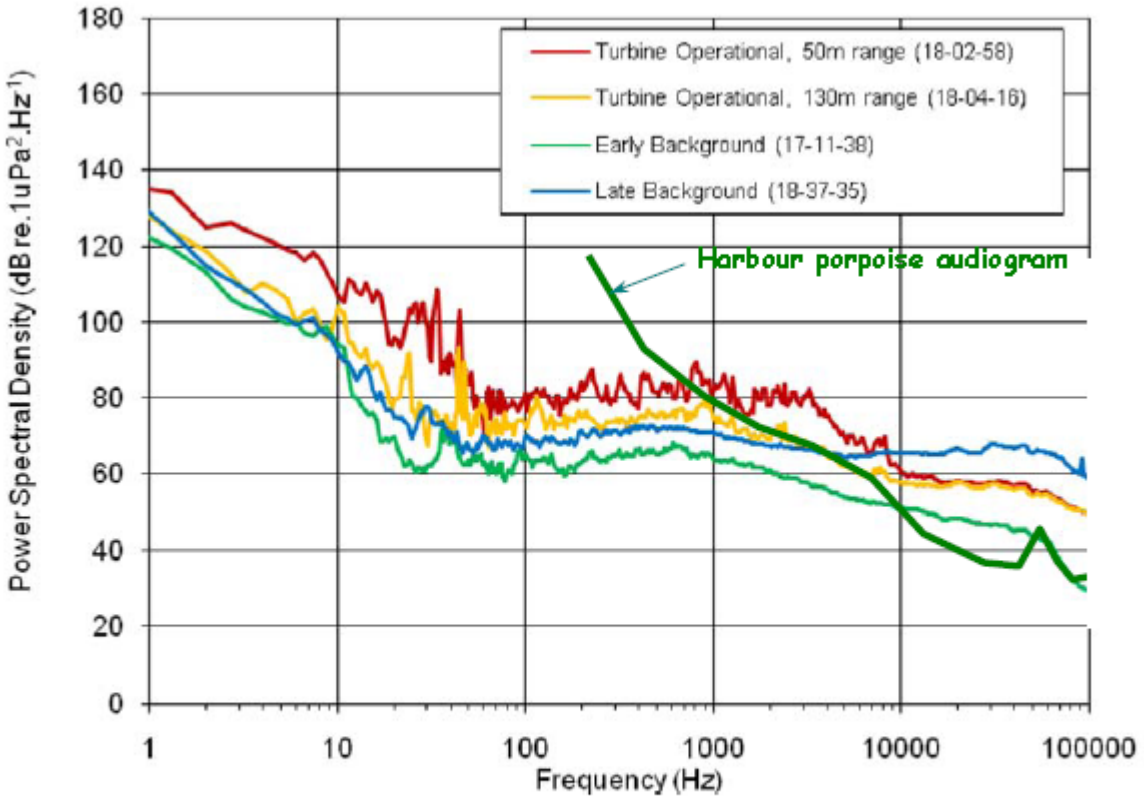


Figure 4. Comparison of Underwater Noise from the OpenHydro Tidal Turbine and the Harbour Porpoise Audiogram

Collected data for operational turbine in Orkneys – overlay marine mammal audiology data

Noise

Measured ambient marine noise in Kaipara Harbour

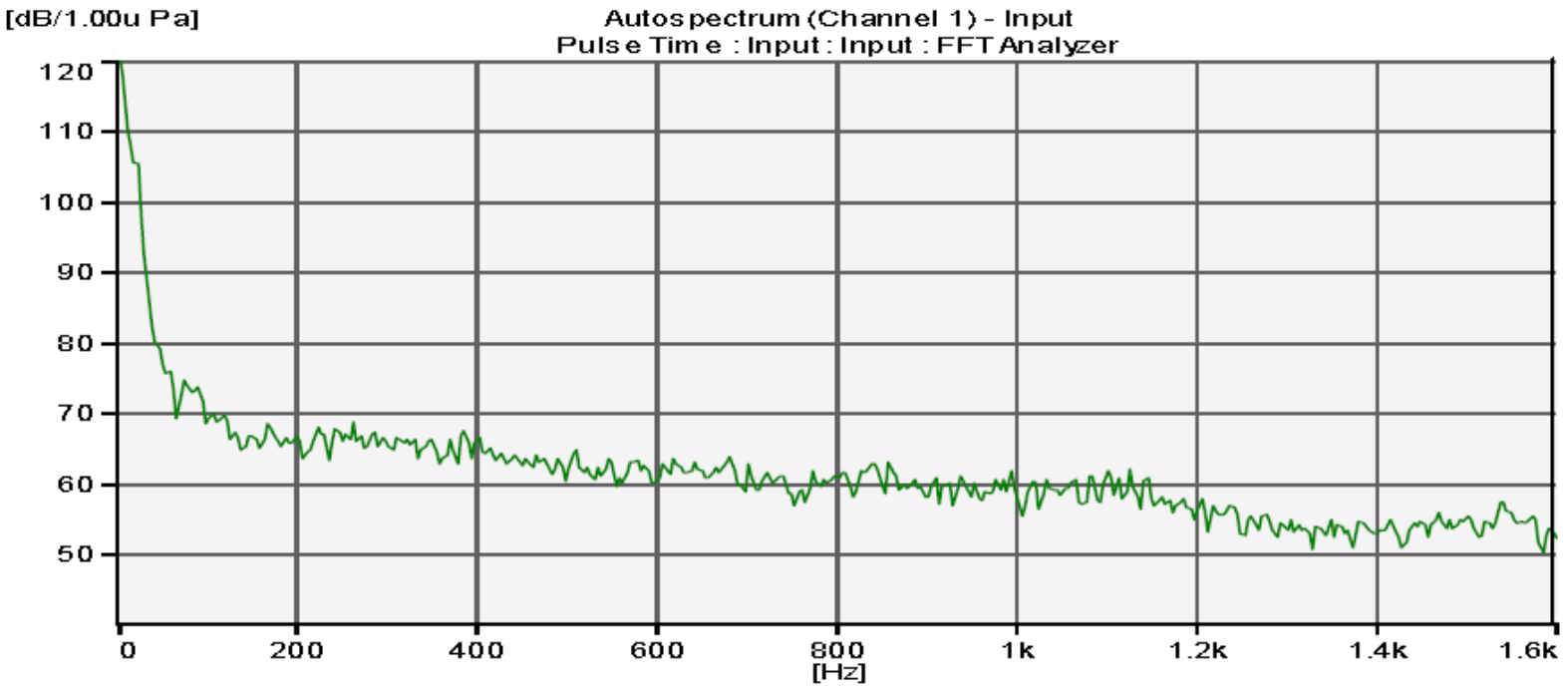
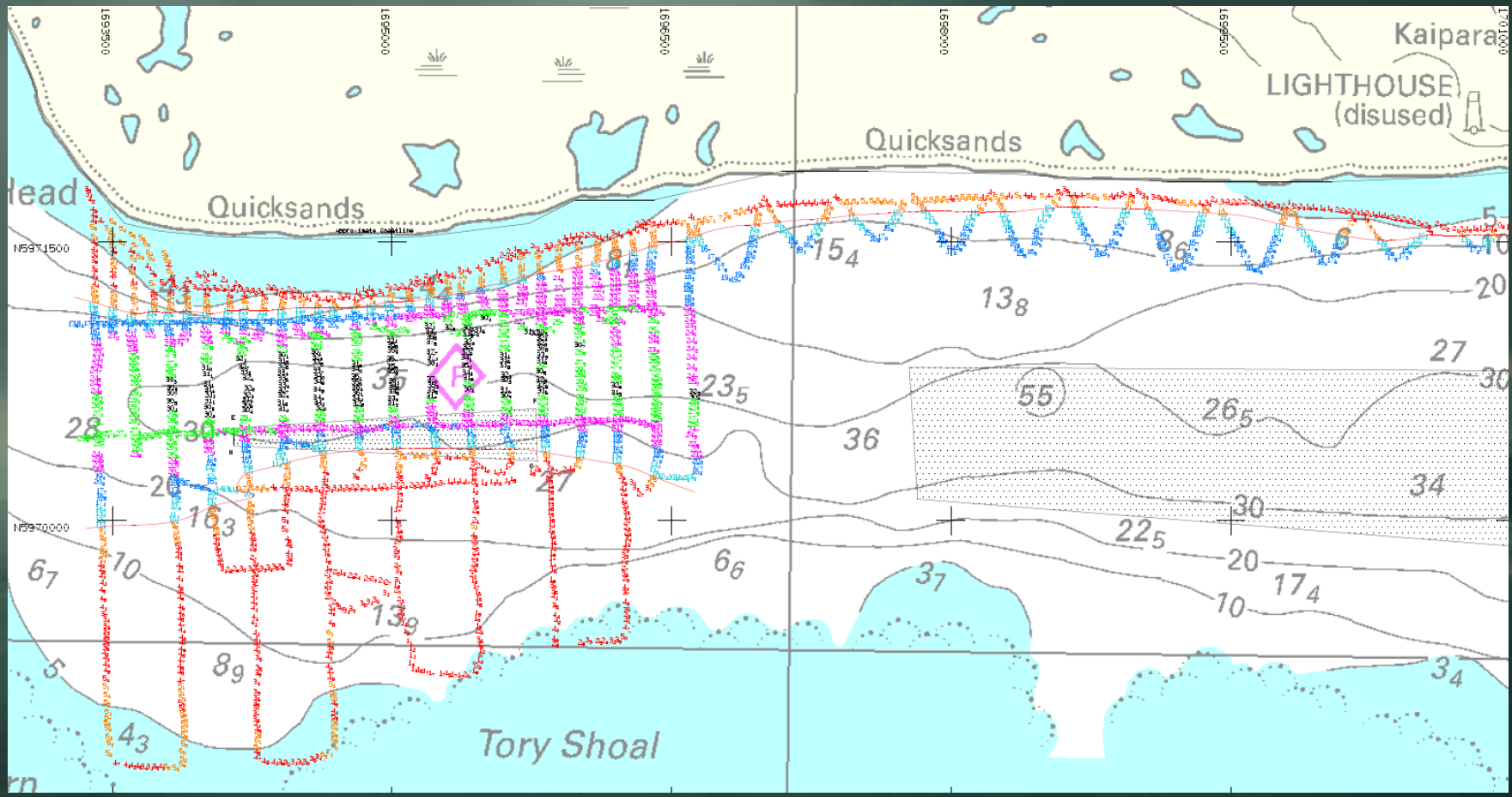


Figure 3. Measured Noise, Site 2 at 20m

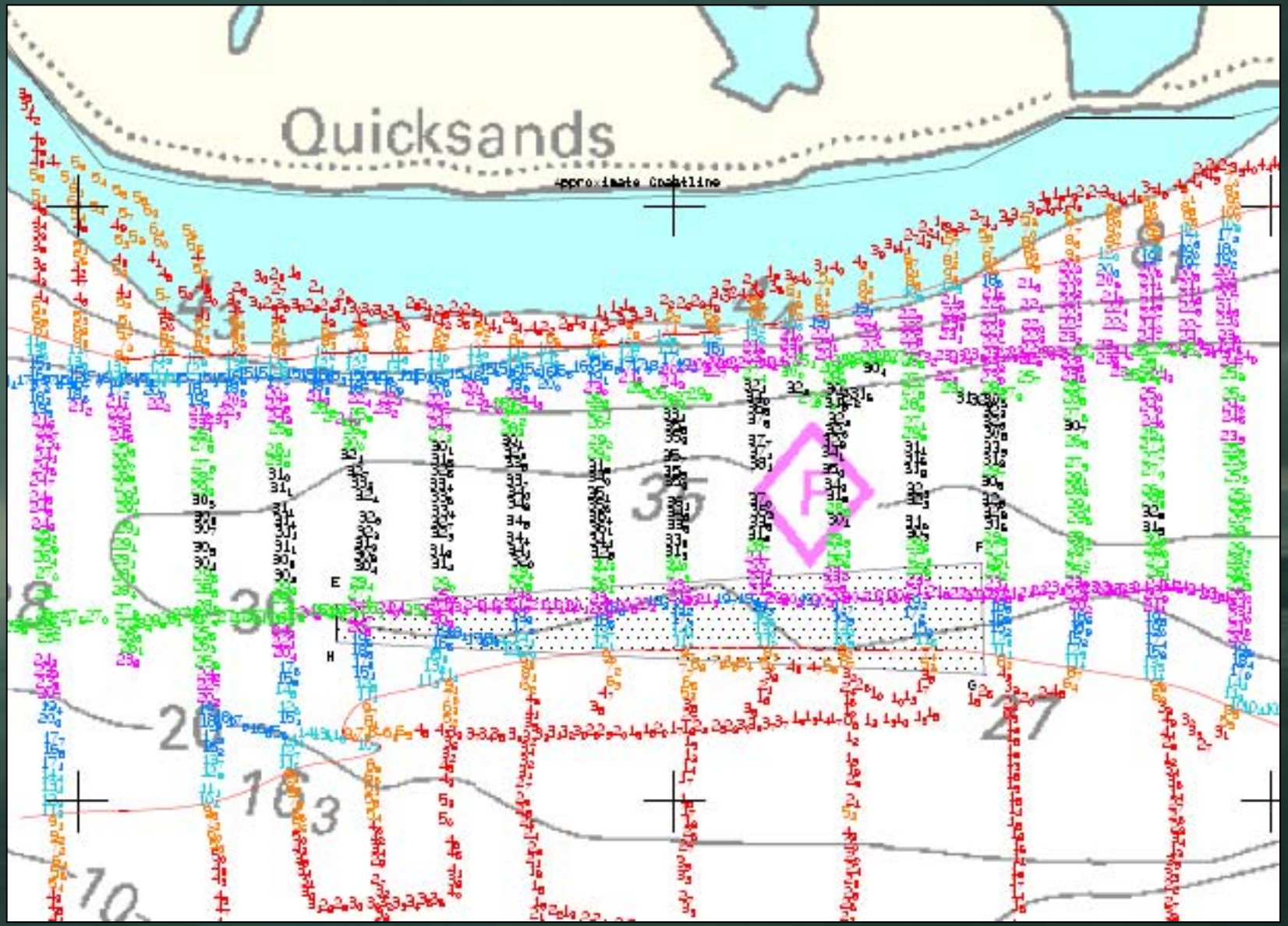
Concluded that turbine noise fades to background within short distance

Bathymetry



Detailed bathymetry to update older survey data

Bathymetry



Verified deep channel stability – extensive accretion on southern shoals

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Outcome of Investigations

- Low likelihood of effects
- But potentially sensitive aspects (Maui's Dolphin)
- But new activity
- But no-one can be 100% certain
- Therefore adaptive management – staging, monitor and review

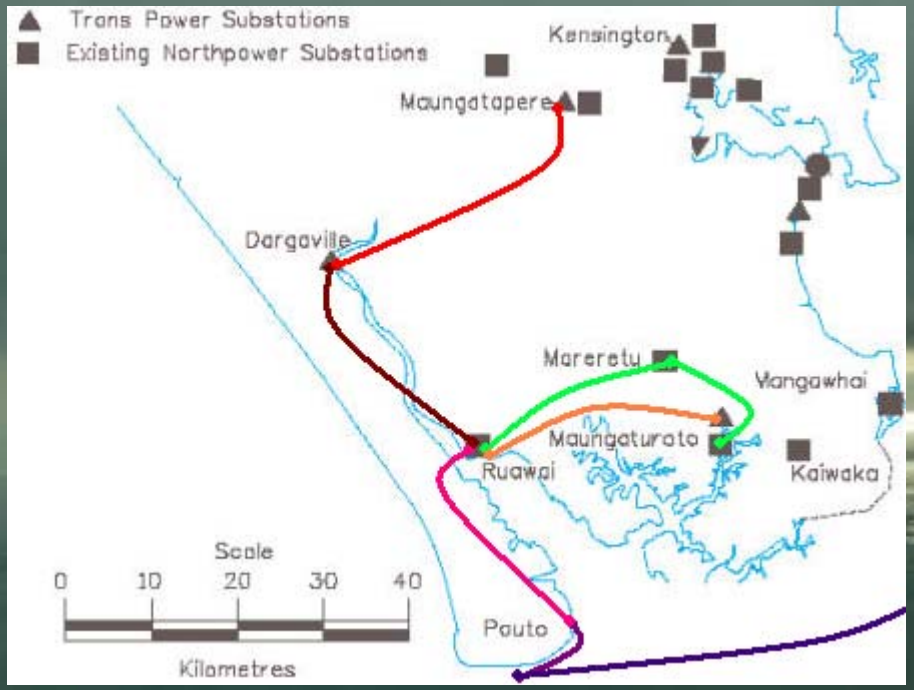
Monitoring

- Key element of adaptive management approach
- Full monitoring plan developed in consultation with stakeholders and regulators, with elements to include:
  - Seabed bathymetry
  - Shoreline profile and erosion characteristics
  - Geotechnical
  - Biology – Marine mammals, fish, benthic biology
  - Noise
  - Water velocities and levels
  - Recreational use
  - EMF

- Likely cost $0.5 - $1 million per year for first 3? Years
- Results to be made publicly available

Landside elements

KDC Certificate of Compliance



TRANSPOWER

Northpower

Tangata Whenua - Consultation

- Crest had philosophy from outset to work with Tangata Whenua
- Crest aware of potential for TW concerns – ready for long and winding road.
- Consultation with Te Uri o Hau kicked off in June 2005
- Original applications lodged July 2006.
- Marae hui Sep, Oct and Dec ’06
- Met TUOH and Ngati Whatua on 19th Dec ‘06
  - Stated they were being rushed and needed more time
  - Concerns about Project scale (200 units) and eastern cable route
  - Required process delay for 6 months - time to assess issues.

Consultation

- Crest agreed to put Project on hold and review project scope to take account of concerns.
- Crest commissioned TUOH to prepare CIA
- Ngati Whatua and Te Uri o Hau set up Working party to help determine a path forward.
- CIA released in July 2007

- CIA Recommended CREST should :
  - Delay application until more testing completed overseas
  - Re-evaluate when a complete information package available.
  - Continue working with Te Uri o Hau/ Ngati Whatua on the initiative
  - Regular reports to marae communities of the Kaipara.
  - If proceeding, Crest to negotiate with Environs over various mitigation measures prior to proceeding to hearing.

CIA Mitigation Measures

- Deploy limited number of turbines to test effects. ✓ Crest Reply
- Agree to kaitiaki based monitoring regime. ✓
- Prioritise role of tangata whenua in decision-making. NRC
- Support for s36, RMA 1991 joint mgt committee for Harbour. ✓
- Bond to cover costs of any significant effect, including removal ✓
- Energy ‘levy’ on each kilowatt leaving the rohe to fund “sustainable community fund” for the Kaipara Harbour. Trust
- Place agreed percentage of the shares in the company in community ownership. Trust
- Contribute operating profits to Catchment Management Plan. Trust
- Provide environmental/marine science/resource management related university scholarships to build capacity of kaitiaki monitors. ✓
- Supply free/subsidised domestic power supply to local communities. Trust

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Kaipara Harbour Environment Trust

- Trust offered in recognition of financial mitigation issues in CIA
- Funded at $100,000 per yr from Stage 1 then $250,000 per yr
- Trust value of $6-8 million over term of project.
- Objective of Trust to distribute funds against projects to:
  - (i) improve the environmental health of the Kaipara Harbour
  - (ii) provide associated socio-economic opportunities.
- Independent of Crest Energy
- Trustees as proposed to Environment Court:
  - 3 nominated by Te Uri o Hau;
  - 1 local community from Pouto area;
  - 1 Kaipara recreational fishing community;
  - 1 Consent Holder.
  - 1 commercial fishing/charter boat operator community;
  - 1 regional business development community.

TUOH from mid-2007

- Strong opposition at NRC hearing
- Appealed NRC decision – decline; if not 10 years baseline monitor.
- Declined to discuss/mediate appeal with Crest
- Successfully stopped Crest from getting priority hearing
- Apr ’09 lodged claim under Foreshore and Seabed Act 2004
- Apr ’09 sought adjournment of Env. Court hearing pending resolution of FSA claim – declined by Env. Court
- 3 Jun ’09 High Court appln. to defer Env. Court Hearing– declined – costs awarded against them (Env. Court start 8th Jun ’09)
- Oct ’09 Treaty Claim – against DoC and EECA – unspecified relief

Outcome

- Consultation delays have added 18 months to the 4 year timeline
- Process came to a grinding halt on 19th Dec 2006
- No clear explanation ever provided
- Attempts to delay seem ongoing
- TUOH consultants have talked informally about wind farms where landowners are paid rental – why shouldn't marine energy projects pay rental to landowners of the Foreshore and Seabed?

- Counter argument is why shouldn't marine energy projects be treated like hydro projects in terms of land occupation?

Where to from here?

- Tidal marine energy generation is renewable, predictable and invisible and, along with wave generation, has wide potential in New Zealand and through the Pacific
- New technology – perception of uncertainty – need to be cautious – adaptive management is accepted mechanism
- In my view, the Crest Project has more than ticked all the RMA boxes (obviously Env. Court Decision will show if I'm right!)
- But it seems the underlying question is "Who will be the landlord for a $400m-$600m project involving 200 marine turbines?"
- Is that a proper RMA question?
- Crest first cab off the rank - implications for other NZ marine energy projects

Questions

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