A “Detailed First Pass” coastal hazard assessment for a long complex coast: Kingborough LGA, Tasmania

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smartline
coastal data segmentation

bluewren
GROUP

Kingborough

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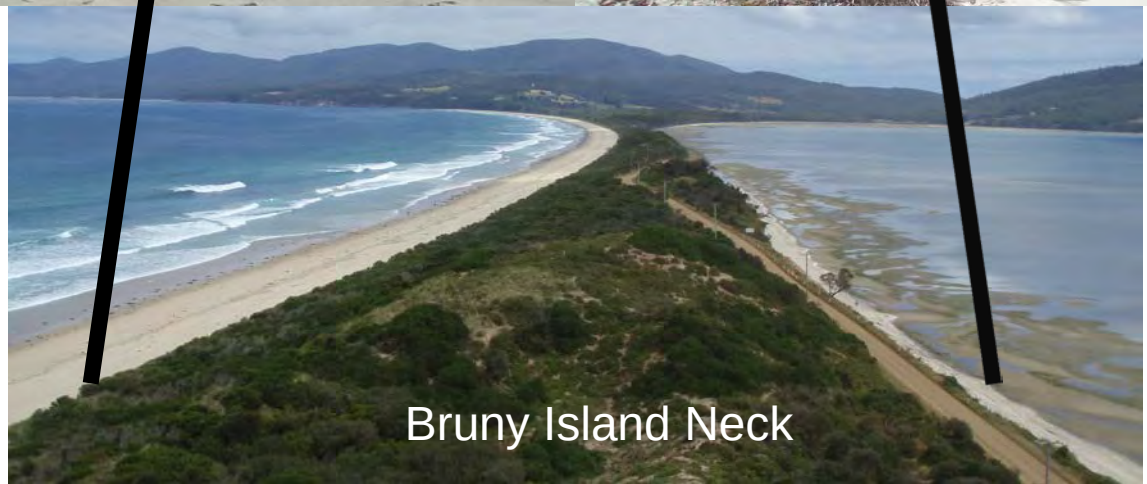
Kingborough LGA, south-eastern Tasmania

- A long, complex microtidal coastline:
- Hard rocky embayed open coast with high energy cliffs, sandy beaches and barriers;
- Extensive swell-sheltered channel with sandy, muddy, soft rock and hard-rock shores exposed to local wind-wave climate

Kingborough sandy shores: swell-exposed & swell-sheltered

‘Exposed’ ocean side – still recovering after erosion events



‘Sheltered’ channel side – eroding progressively without recovery

Kingborough hard-rock shores: Exposed and sheltered; sloping and cliffed

Cliffed hard-rock shores: some instability but recession to 2100 generally likely to be minor

Moderately sloping hard-rocky shores: negligible erosional recession likely by 2100
(also minimal susceptibility to inundation)

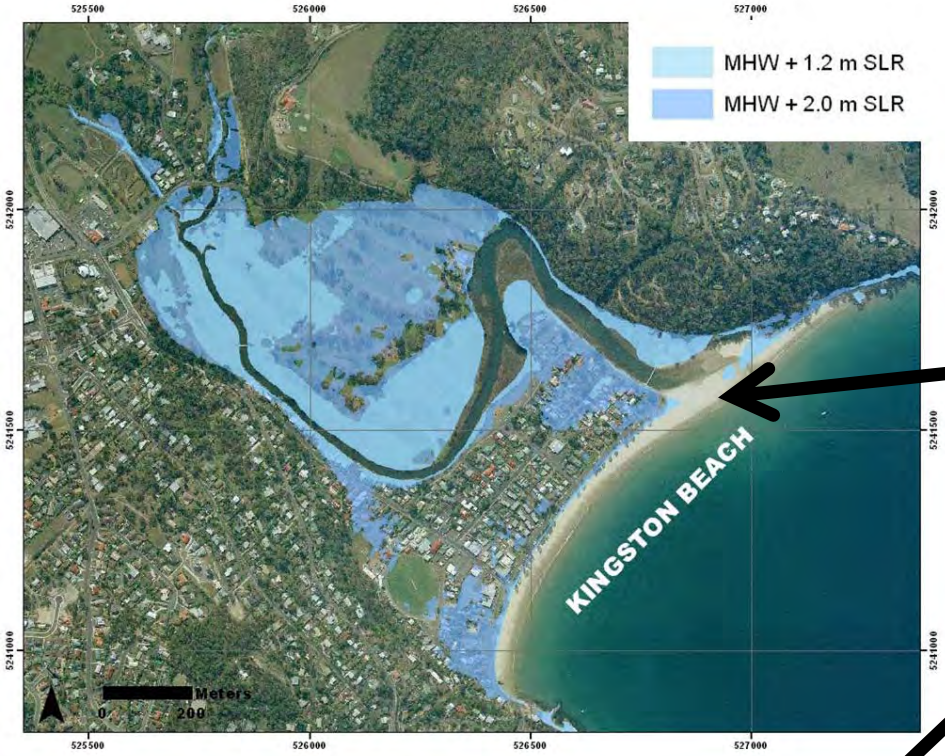
Kingborough soft rock shores

Widespread shores in Tertiary-age semi-lithified cohesive clays, sandstones and conglomerates.

Mainly swell-sheltered shores, but exposed to local wind-waves.

Actively eroding & receding in many areas (cannot recover after erosion events, thus erosion is progressive)

Some previously known coastal hazard issues



Council was aware of some coastal hazard issues in Kingborough:

- Existing flood modelling for Kingston Beach;
- Soft rock erosion imminently threatening esplanade road at Margate.

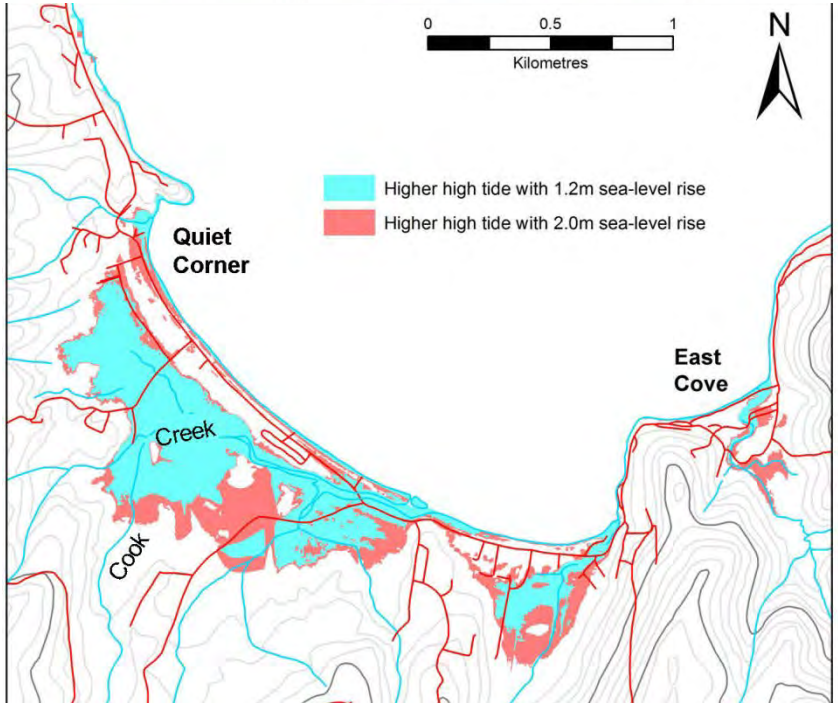
But council unsure of full scope of coastal hazards in Kingborough;

Needed comprehensive identification of potential risks across whole LGA;

Little money available

“Detailed First Pass” approach used

- Simple modelling of ‘worst case’ erosion and inundation scenarios to 2100 (highlights all areas where further work warranted if assets at stake);
- Comprehensive identification of all shore types potentially susceptible to erosion & recession (not just sandy open coast shores!);
- Includes identification of resilient low-hazards shores (easy, useful and generally ignored);
- Assessment and description of hazards organised by logical geomorphically-defined coastal compartments;
- Mostly based on existing data, with some fieldwork and interpretation of geomorphic process environments.



Inundation modelling

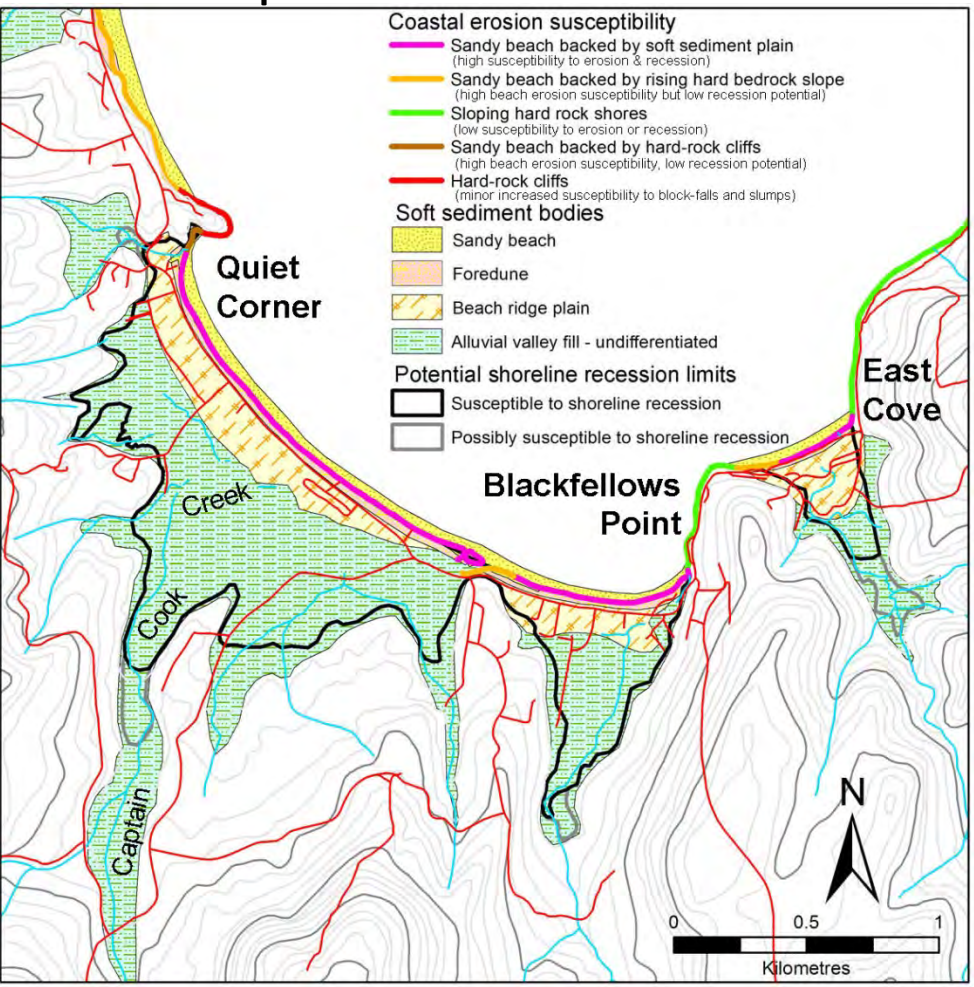
- Simple 'bathtub' modelling of worst-case scenarios for 2100;
- Mapped 2100 HWM with 2.0m sea-level rise (maximum thought possible: Pfeffer *et al*. 2008);
- Allows for more realistic lower rise with storm surge allowance on top;
- Identifies full extent of potential hazard areas – for further detailed assessment if locations critical;
- Also identified major estuaries with co-incident coast-river flood hazard.

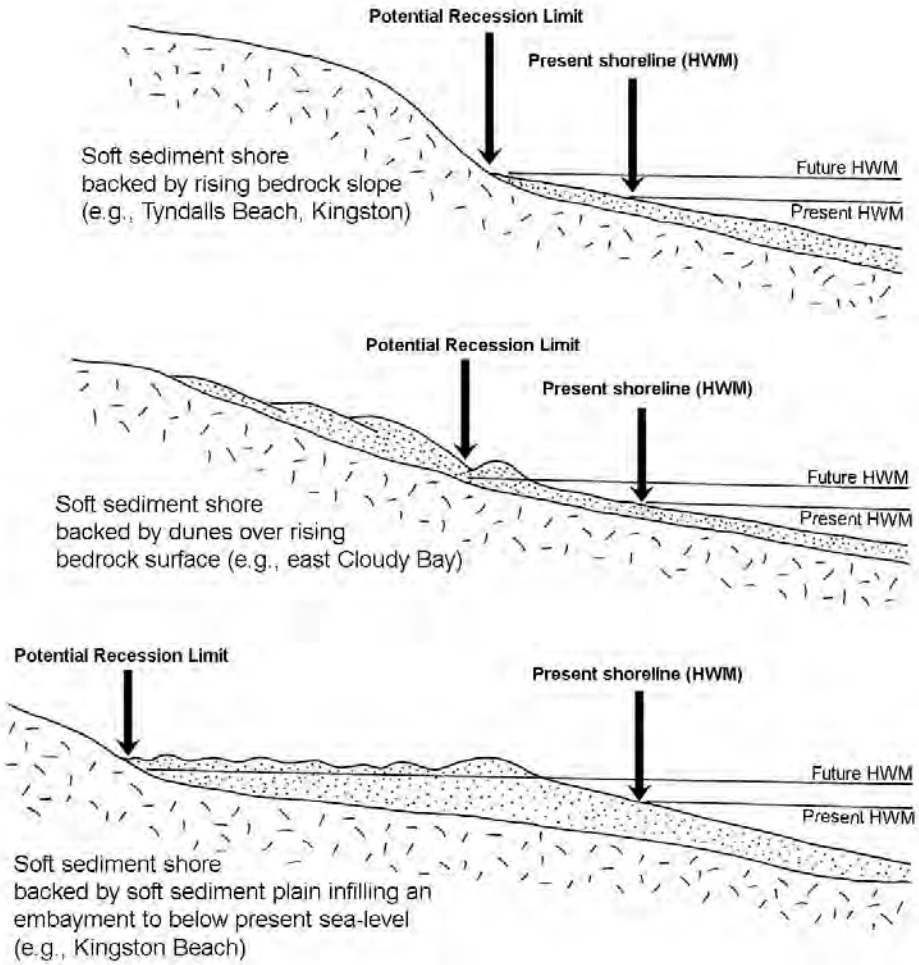
Erosion & Recession hazards

- Identified hazards for three basic shoreline types:
  - Soft sediment shores
  - Soft rock shores
  - Hard rock shores

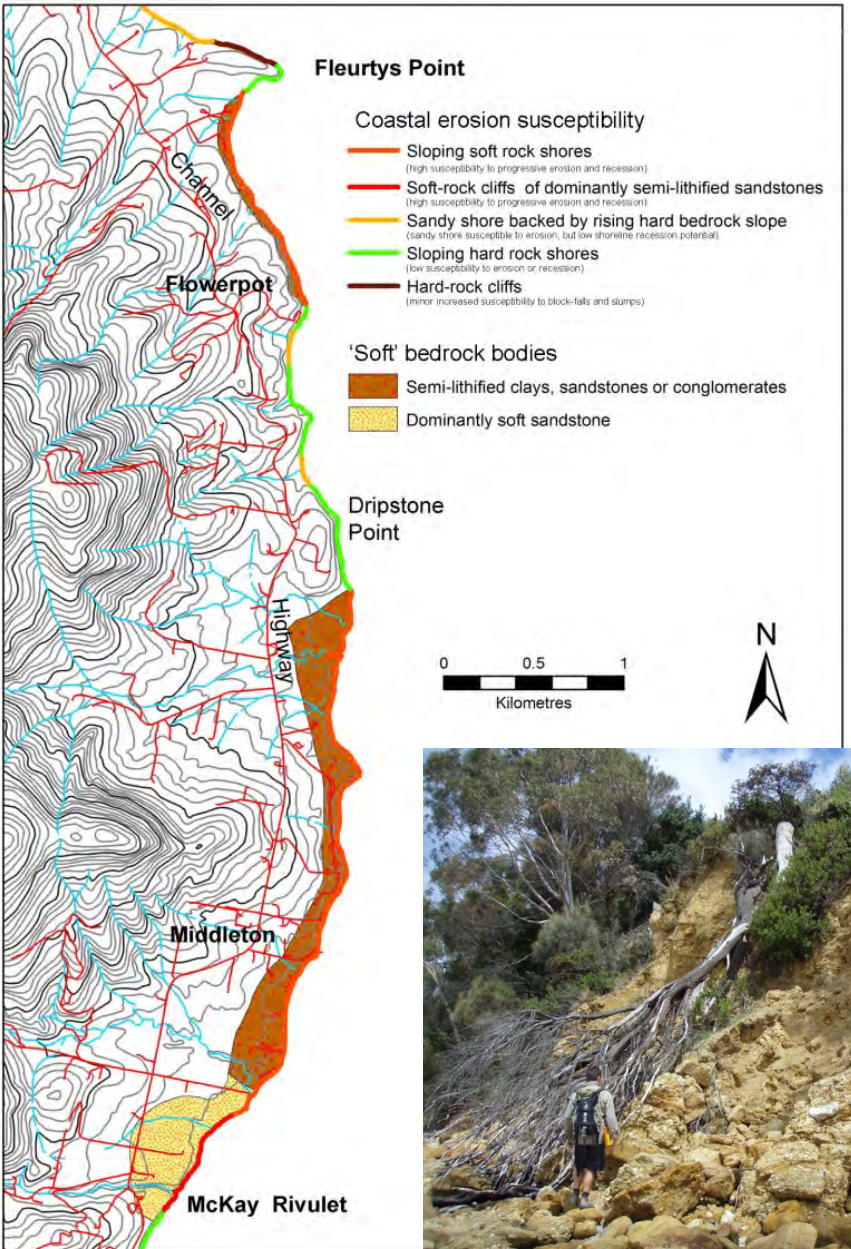
Soft sediment shores

- Stand-alone coastal unconsolidated Quaternary sediments layer prepared (most geological maps omit some Quaternary);
- Maximum possible soft shore recession envelopes interpreted on assumption of max. 2m sea-level rise by 2100.



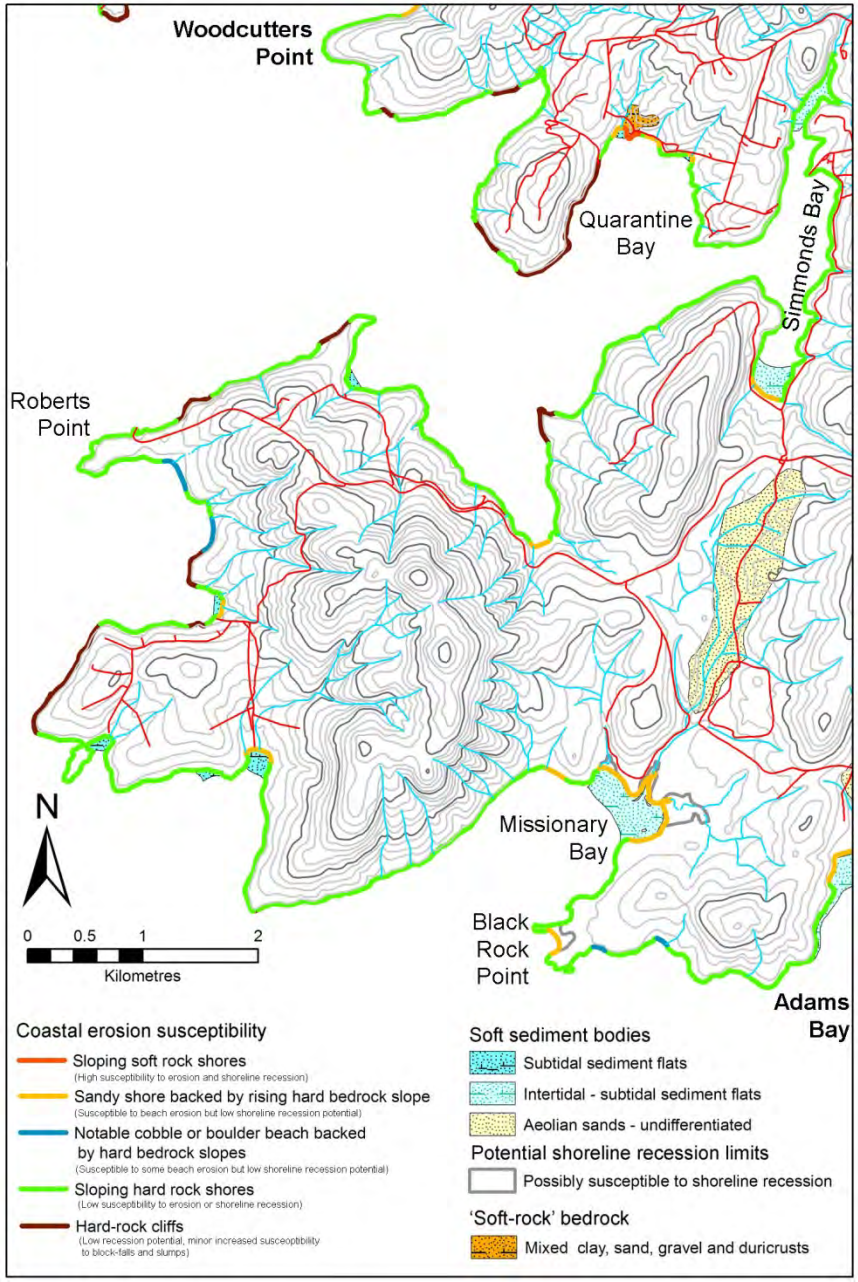


Soft rock shores

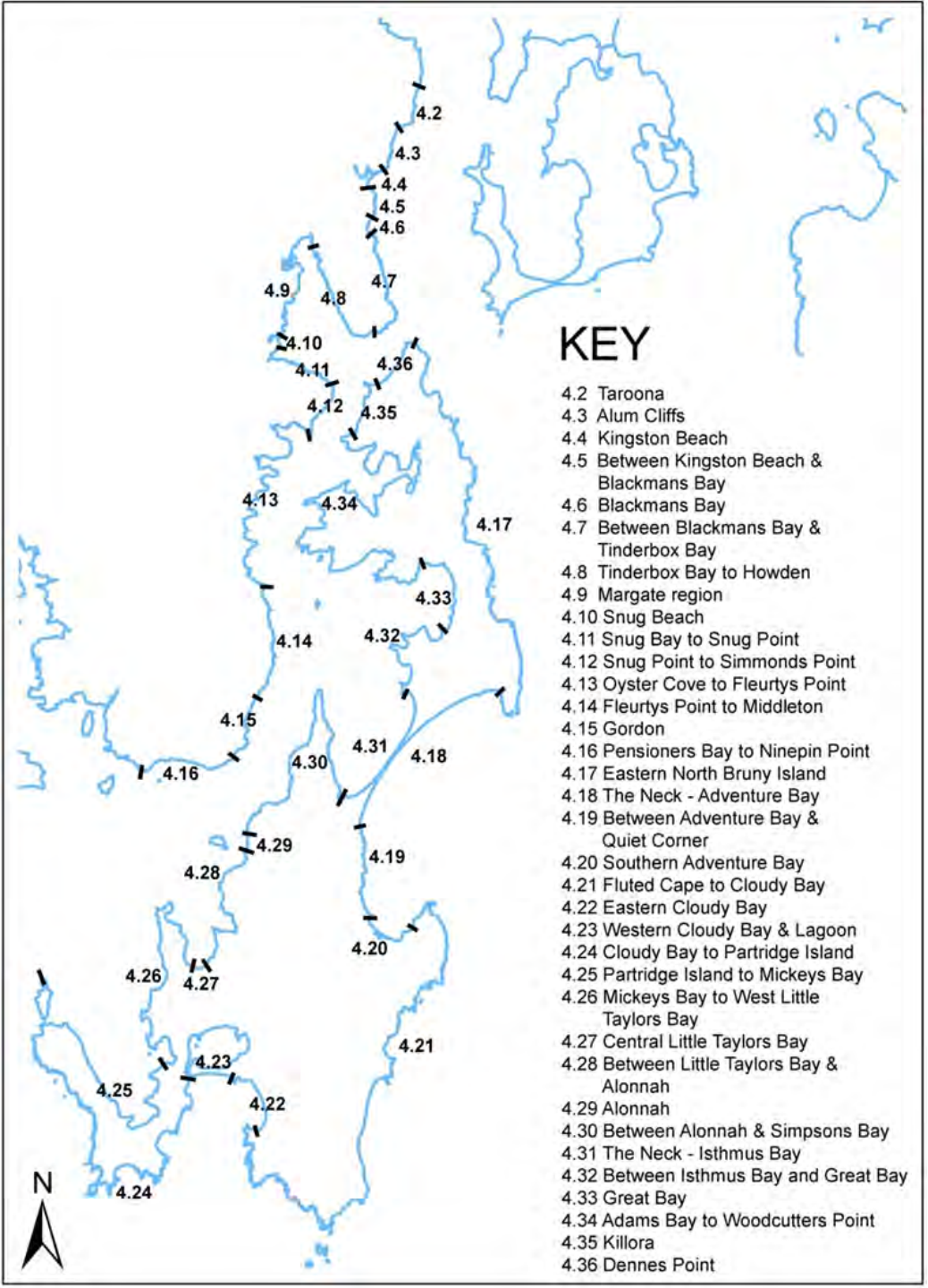


- Stand-alone soft-rock geology map interpreted from existing geological maps (which often show mainly Quaternary cover for these areas);
- Recession potential to 2100 estimated from known C20th recession rates with allowance for sea-level rise effects (generally implausible that these bodies would recede to their full extent by 2100).

Hard rock shores



- Used existing *Smartline* (with additional field-checking) to identify & represent these;
- Differentiated between gently-to-moderately sloping hard rock shores (very resilient) and steep to cliffed (some potential for instability).



Coastal Compartments

Kingborough divided into compartments based on dominant landform types and wave climate exposure;

These are distinctive geomorphic units and thus appropriate planning & management units;

Report summarises the hazard issues for each using the indicative hazard mapping together with interpretation of known coastal processes.

Kingborough:
Summary coastal hazard 'hotspots'

Kingborough LGA - Hazard hotspots with infrastructure at risk

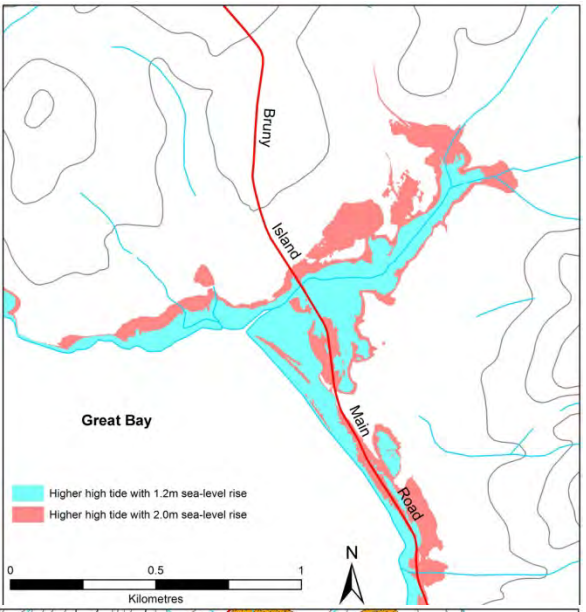
Summary: shores with minimal erosion & flooding hazards

Kingston – Blackmans Bay

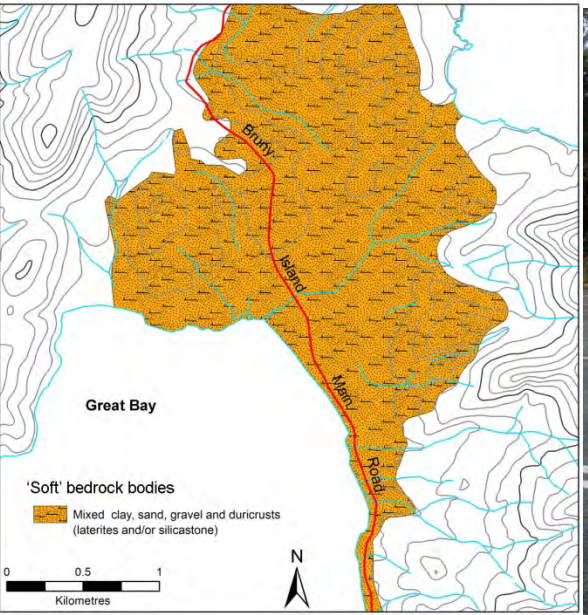
Resilient, low-flood hazard, sloping hard rocky shores are widespread in Kingborough;

Should be valuable information for planning & policy?

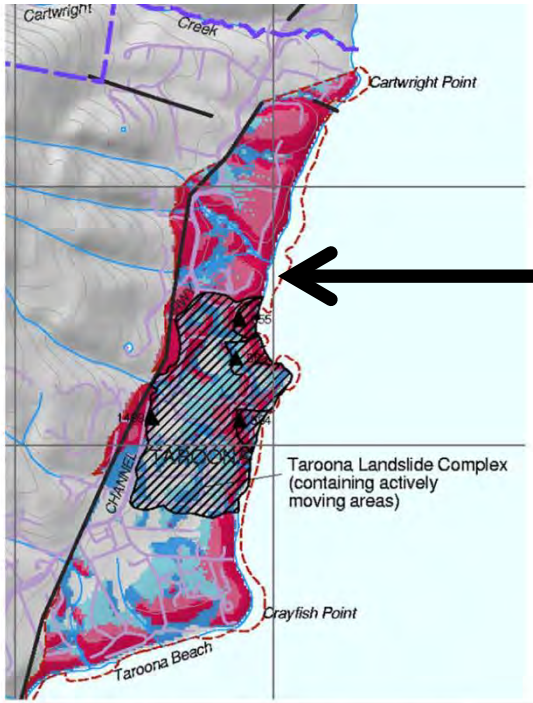
New information generated – Great Bay flood & erosion risks recognised

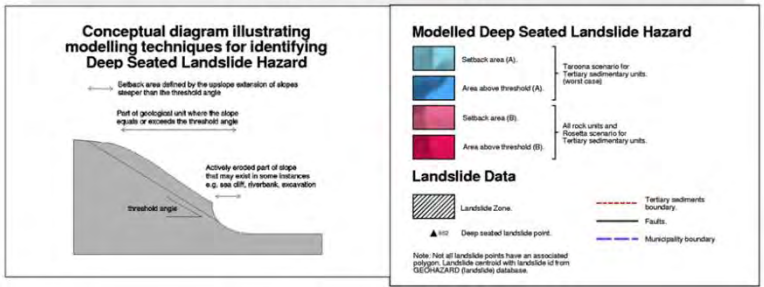


- Significant risk of inundation and shoreline recession by 2100;
- Bruny Island Main Road very low and a few metres behind shore;
- Council had not previously recognised this site as hazardous.



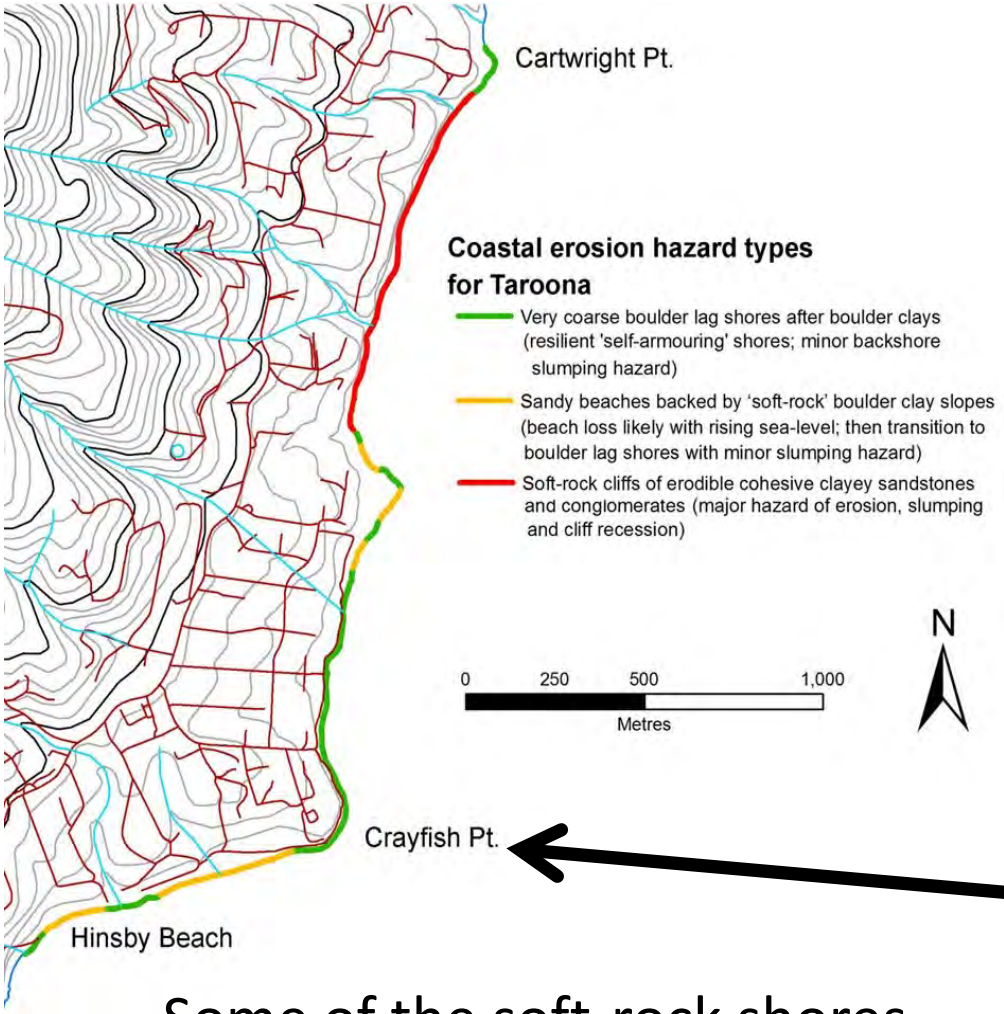
New information generated – known landslide hazard modelling relevant to the shoreline





Council aware of landslide hazard modelling for Taroona;
but didn't realise slumping hazard greatest at (soft-rock) shoreline.
Many houses potentially at risk.

New information generated – Taroona soft-rock hazard is variable



Some of the soft-rock shores are "self-armouring"

Key advantages

- Logical to comprehensively assess large areas at 'first pass' level <u>first</u>, else hazard hotspots can be missed;
- Provides solid (comprehensive, systematic) basis to prioritise hot spots for further assessment;
- Simple method, mostly uses available info (*Smartline*, simple bathtub inundation modelling) plus expert geomorphic interpretation (processes, erosion limits, etc);
- Low cost, relatively quick, comprehensive identification of wide variety of coastal hazard issues.

Thank You

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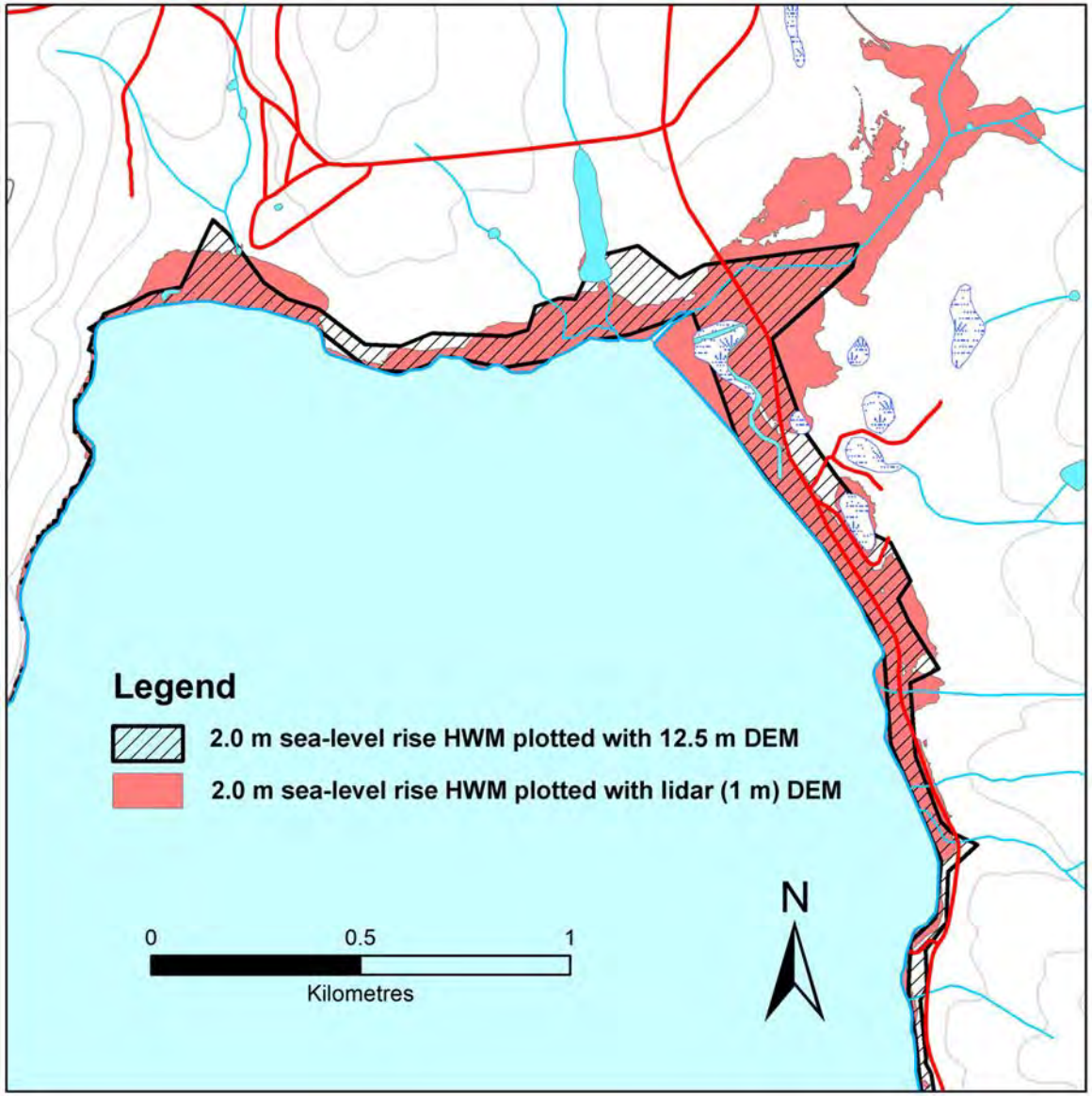
Inundation modelling resolution dependant on available topographic data



Inundation modelling most reliable where Lidar DEMs available.

However even lower resolution topographic data allows indicative identification of potential inundation hot-spots (still useful).

Comparison of modelled HWM after 2.0m sea-level rise using 1m Lidar DEM (limited coverage) and 12.5m DEM (state-wide coverage)