Port Sorell - Tamar TAS03.02.01

Regional Setting

This compartment extends from East Devonport to Low Head.

The open coast beaches are exposed to moderate to high energy south-westerly swells refracted into Bass Strait (significantly higher swell-wave energies than adjacent north-west coast, owing to different coastal orientation); they can also be exposed to strong seas during westerly or north-westerly wind events.

The Tamar estuary and Port Sorell are sheltered from swell, except near their mouths; local wind fetches within these estuaries are highly variable, but in many places, multi-kilometre fetches produce local wind-waves that can readily erode sandy shores and the cohesive clayey soft-rock shores which are common within both estuaries. Water levels in the estuaries are affected by tidal amplification (especially in the Tamar) and can be strongly affected by catchment flooding which may be co-incident with coastal storm surges.

Meso-tidal range up to 3.5 metres, with amplification of tides going deeper into the Tamar estuary (Kidd, Chai & Fischer 2014).

The dominant regional processes influencing coastal geomorphology in this region are the Mediterranean to humid cool-temperate climate, micro-tides, high energy south-westerly swells, westerly seas, carbonate sediments, interrupted swell-driven longshore transport, and the Southern Annular Mode (driving dominant south-westerly swells and storms).

Regional hazards or processes driving large scale rapid coastal changes include: mid-latitude cyclones (depressions), storm surges and shelf waves.

Justification of sensitivity

Open coast beaches have a sensitivity rating of 3; these are late responders with static sand budgets. Bakers Beach may recede earlier as Port Sorell sand sink capacity grows. Soft rock shores in the estuaries are receding and are likely early responders (sensitivity 5).

The major source of coastal sand in this compartment was shelf sands from Bass Strait moved onshore by wave action during post-glacial marine transgressions, together with some reworking of older sand bodies and Tertiary-age soft sediments at the shore (Davies, J.L. & Hudson 1987). The ultimate source of the sands worked onshore from Bass Strait was river and glacial outwash brought down the major rivers from glaciated highlands during glacial low sea stands.

However, there is little or no ongoing supply of sand from the present-day rivers (Davies, J.L. & Hudson 1987), and sediment mobility modelling (Harris & Heap 2014) indicates there is unlikely to be significant ongoing supply of sand from offshore.

The dominant, swell-driven, alongshore sand transport direction in this compartment is west to east. However, the prominent rocky headlands between each beach embayment (Point Sorell, Badger Head and West Head) are significant, although probably not complete barriers to alongshore sand transport (Davies, J.L. 1973). Sand is probably episodically re-distributed within, but not significantly lost from each embayment. Although there has been landwards loss of sand in active transgressive dunes behind these beaches in the past, these are now stable. Port Sorell and the mouth of the Tamar estuary are sand sinks which contain large sand bodies. Although these estuaries are currently 'full' of sand (Davies, J.L. & Hudson 1987), their capacity to accept more sand from the open coast will increase as sea-level rise creates additional accommodation space.

Given that each of the open coast beaches probably has a currently static sand budget, with little capacity for either gain or loss of sand from each embayment, and is exposed to swells which return eroded sand to the shore after erosion events move it offshore, these open coast beaches are likely to be late responders to sea-level rise, which probably will not show a progressive recession in response to sea-level rise for some decades at least (sensitivity rating 3). However, there will likely be some differences in response between the beaches, with Bakers Beach potentially beginning to recede earlier as sea-level rise creates new accommodation space, and thus a new sink for eroded beach sand in Port Sorell, so tipping that beach into a losing sand budget. (See ***Figure 2***: a sensitivity rating of 4 for this beach is implied. Note, however, that some of the new accommodation space may be filled by sediment eroded from the shores of Port Sorell itself, hence the rate and magnitude of increased sand loss from Bakers Beach is unclear). In contrast, Northbourne Beach and Badger Beach – having no major current or potential future sand sink – may take longer to show a recessional response.

Within Port Sorell and the Tamar estuary, narrow sandy shores and cohesive but erodible 'soft-rock' clayey sandstones and conglomerates of Tertiary age are widespread at the shoreline and commonly show evidence of recently active shoreline recession (***Figure 3***). No shoreline history data is currently available for these shores. However, with no capacity for natural shoreline recovery, their active recession rates can be expected to accelerate with sea-level rise (Trenhaile 2011) and they are probably early responders to sea-level rise (sensitivity rating 5).

Other comments

There is relatively little infrastructure at risk from shoreline recession behind the three major open coast beaches in this compartment, which are mainly backed by National Park (at Bakers Beach and Badger Beach) and rural land (at Northbourne Beach).

The establishment of *Spartina* (an introduced littoral weed) in more sheltered reaches of the Tamar estuary has caused major changes to shorelines through trapping of fine silty-mud, causing accretion of soft intertidal muds in many areas.

Some sections of the soft cohesive clay shoreline in the Tamar estuary are artificially protected, which attests to prior erosion problems on those shores. Infrastructure (roads and buildings) are potentially at risk from shoreline recession behind a number of cohesive clay shores in the Tamar estuary.

Inundation is not a significant issue on the open coast sections which are either backed by dunes or rising bedrock slopes. However, inundation is a major hazard in both the Tamar estuary and Port Sorell, where extensive low-lying backshores are susceptible, and coastal storm surges with co-incident river catchment flooding may create major flooding events.

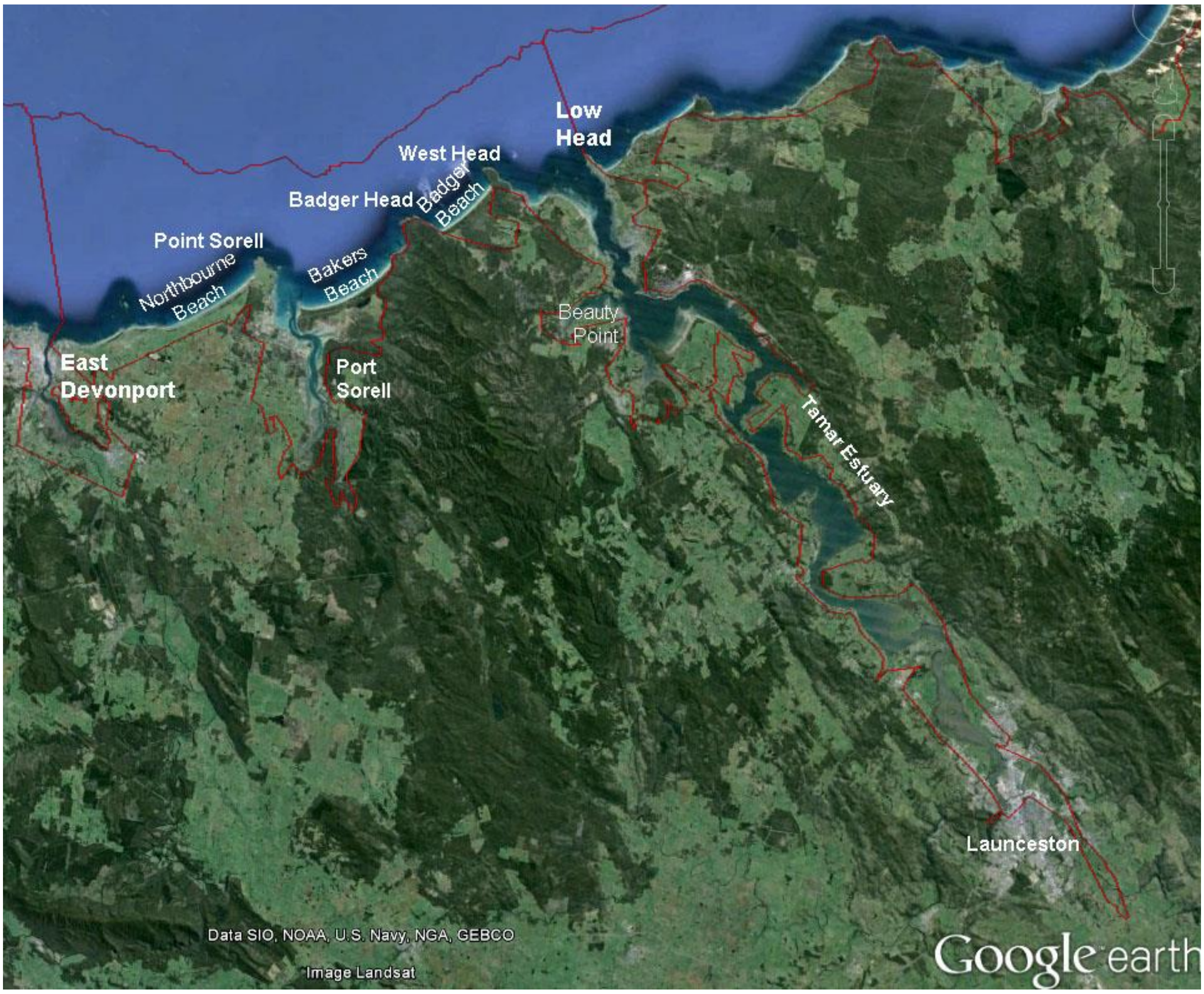

Figure 1: *Compartment TAS03.02.01 Port Sorell – Tamar.*

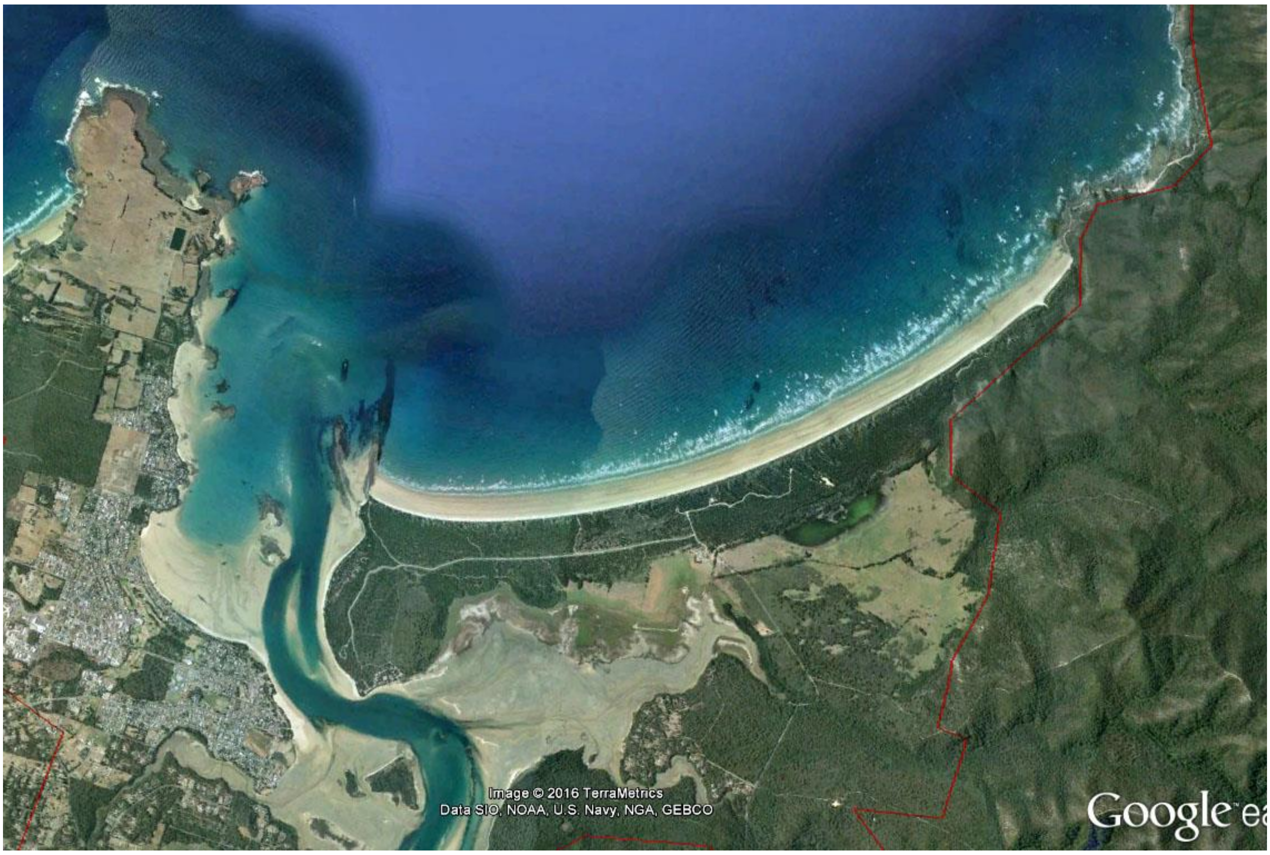

Figure 2: *Port Sorell is a tidal inlet behind the extensive prograded sandy barrier of Bakers Beach. Although Port Sorell is currently 'full' of sediment, with only limited accommodation space for more sand from Bakers Beach, ongoing sea-level rise will create additional (vertical) accommodation space for sand. This means it is likely that some eroded sand from Bakers Beach will begin to be lost from the beach into Port Sorell via tidal currents, rather than being returned to the beach, resulting in Bakers Beach beginning to progressively recede in response to sea-level rise earlier than nearby beaches, which are likely to maintain a static sand budget for longer.*

Figure 3: *An actively receding shoreline in Tertiary-age, cohesive clay 'soft-rock' at Beauty Point within the Tamar estuary. These soft erodible shores have mostly been artificially protected close to infrastructure assets, such as areas of Beauty Point, but remain susceptible to accelerating erosion with sea-level rise in many locations as shown here. Photo by C. Sharples (2013).*

Confidence in sources

Medium confidence: No detailed coastal geomorphic studies. This assessment is based on available geological mapping, field inspections and other information as listed below.

Additional information

Geological mapping at several scales is available for this compartment and is relevant to coastal geomorphic hazard assessment. Very detailed recent geomorphic mapping is also available for the Tamar estuary (from Mineral Resources Tasmania).

The following sources have been cited above:

Davies, JL 1973, 'Sediment Movement on the Tasmanian Coast', in *1st Australian Conference on Coastal Engineering*, vol. Australia National Conference Publication No. 73/1, pp. 43-46.

Davies, JL & Hudson, JP 1987, 'Sources of shore sediment on the north coast of Tasmania', *Papers and Proceedings of the Royal Society of Tasmania*, vol. 121, pp. 137-151.

Harris, PT & Heap, A 2014, 'Geomorphology and Holocene Sedimentology of the Tasmanian Continental Margin', in KD Corbett, PG Quilty & CR Calver (eds), *Geological Evolution of Tasmania*, Geological Society of Australia (Tasmania Division), pp. 530-539.

Kidd, IM, Chai, S & Fischer, A 2014, 'Tidal Heights in Hyper-Synchronous Estuaries', *Natural Resources*, vol. 05, no. 11, pp. 607-615.

Trenhaile, AS 2011, 'Predicting the response of hard and soft rock coasts to changes in sea level and wave height', *Climatic Change*, vol. 109, pp. 599-615.