Bay of Fires TAS01.02.02

Regional Setting

This compartment extends from Eddystone Point to St Helens Point.

This coast is microtidal, receives refracted south-westerly swells as well as more direct Tasman Sea swells, and is also exposed to seas generated by extra-tropical cyclones (East Coast Lows).

The dominant regional processes influencing coastal geomorphology in this region are the humid warm to cool temperate climate, micro-tides, south-easterly Tasman Sea swells, easterly seas, dominantly quartz (terrigenous) sediments with northerly longshore transport in the northern part, and the El Nino Southern Oscillation (driving beach erosion/accretion cycles, cyclone frequency).

Regional hazards or processes driving large scale rapid coastal changes include: East Coast Lows (extra-tropical cyclones), mid-latitude cyclones (depressions), and storm surges (<1m).

Justification of sensitivity

The sensitivity rating of this compartment's open coast is a 3. The sand supply is near-stable and these beaches are probably late responders to sea-level rise. Soft (semi-lithified) shores within Anson's & Georges Bays are receding & likely early responders to sea-level rise (sensitivity 5).

Beach sand in this compartment is likely to have been mostly derived from shelf sands blown landwards during glacial low sea stands, and reworked landwards by wave action during post-glacial marine transgressions. However, the visibly distinctive character of much of the beach sands in this compartment (whiter silica grains with less weathering-derived iron oxide patina compared to most other Tasmanian beach sands) suggests a geologically-recent contribution of silica sand, derived from fluvial erosion of deeply-weathered granites that characterise much of

this compartment's hinterland. However, no sand provenance studies are available, and the manner and dating of such inferred fluvial sand supply is unclear. Shelf sediment mobility modelling suggests very little ongoing onshore sand transport from the shelf is likely today (Harris & Heap 2014).

There is probably little or no alongshore leakage of sand into or out of this compartment around St Helens Point or Eddystone Point (Davies 1973); although, it is likely that there has been some northwards leakage of sand out of the compartment, via headland bypass dunes across Eddystone Point, at times during the Holocene. There is probably also some loss of sand from the open coast beaches into the flood tide delta inside the permanently open tidal lagoon of Anson's Bay. There is probably no significant sand loss into Georges Bay since large rocky headlands either side of its mouth are likely to be effective barriers to alongshore sand transport.

Within the compartment, several small rocky headlands probably do not prevent alongshore sand transport between beach embayments. However, it is likely that the dominant mode of sand transport is beach rotation within individual embayments, as swells generally drive a northwards sand drift. The stormy seas related to East Coast Lows (extra-tropical cyclones) may episodically reverse local sand movements. (Note that there is no measured data on beach behaviour in this compartment, and it is not clear that any beach rotation in eastern Tasmania is caused by the same ENSO-driven cycling that dominates on NSW beaches, given the stronger influence of the refracted south-westerly swells on Tasmania's east coast).

Notwithstanding a lack of measured beach behaviour data for this compartment, there are no indications that any widespread progressive shoreline recession has occurred on open coast beaches in this compartment in recent decades (see ***Figure 2***). As described above, the open coast sand budget for this compartment is probably stable or only slightly losing, hence it is likely these beaches will be generally medium-term or late responders to sea-level rise and will probably remain in a dynamic equilibrium (oscillating alongshore and cross-shore) for the medium term future.

As noted above, the sand budget for Georges Bay is probably disconnected from the open coast sand budget for this compartment. Georges Bay is a large, permanently open tidal lagoon, which is a sediment sink that has gained sands formerly blown in

from the south of St Helens Point via the Peron Dunes headland bypass dunes. There has also been a large geologically-recent sediment contribution to the bay from granitic sands artificially eroded by tin mining (sluicing) in the Georges River catchment during the early Twentieth Century and carried down the river. Sand from the continental shelf probably entered the bay during post-glacial marine transgressions, and a small ongoing contribution of sand directly onshore from the shelf is possible. Both hard rock and soft sediment shores are present within Georges Bay. However, the main shoreline erosion issue is recession and active slumping of swell-sheltered, but wind-wave exposed, high steep shores in semi-lithified, Tertiary-age, clayey quartz gravels at Parnella (***Figure 3***). Previous artificial protection at the waterline below these slumps is eroding and without improved protection, an acceleration of coastal slumping at Parnella can be expected with ongoing sea-level rise.

Progressive (non-recovering) erosional recession of semi-lithified Pleistocene terrestrial sands exposed along the swell-sheltered but wind-wave exposed, north-western shore of Anson's Bay has been ongoing during the Twentieth Century and up to the present; this erosional recession can be expected to accelerate with ongoing sea-level rise in unprotected areas (***Figure 4***). However, the presence of freehold shacks (formerly crown coastal reserve) immediately behind much of the eroding shoreline has resulted in construction of artificial protection along parts of this shore.

Other comments

St Helens Township in Georges Bay is a significant sheltered port in northeast Tasmania. The tidal channel entrance to the bay requires frequent dredging due to tidal currents shifting sand bars and creating navigation hazards. This is an ongoing unresolved issue, since the bay and channel are a sediment sink already containing a large amount of sand (some the result of mining - related catchment erosion) and are probably continuing to gain rather than lose sand.

Coastal flooding is a significant hazard in parts of this compartment, particularly around parts of Georges and Anson's Bays where co-incident catchment and storm surge flooding occasionally submerges key coastal roads.

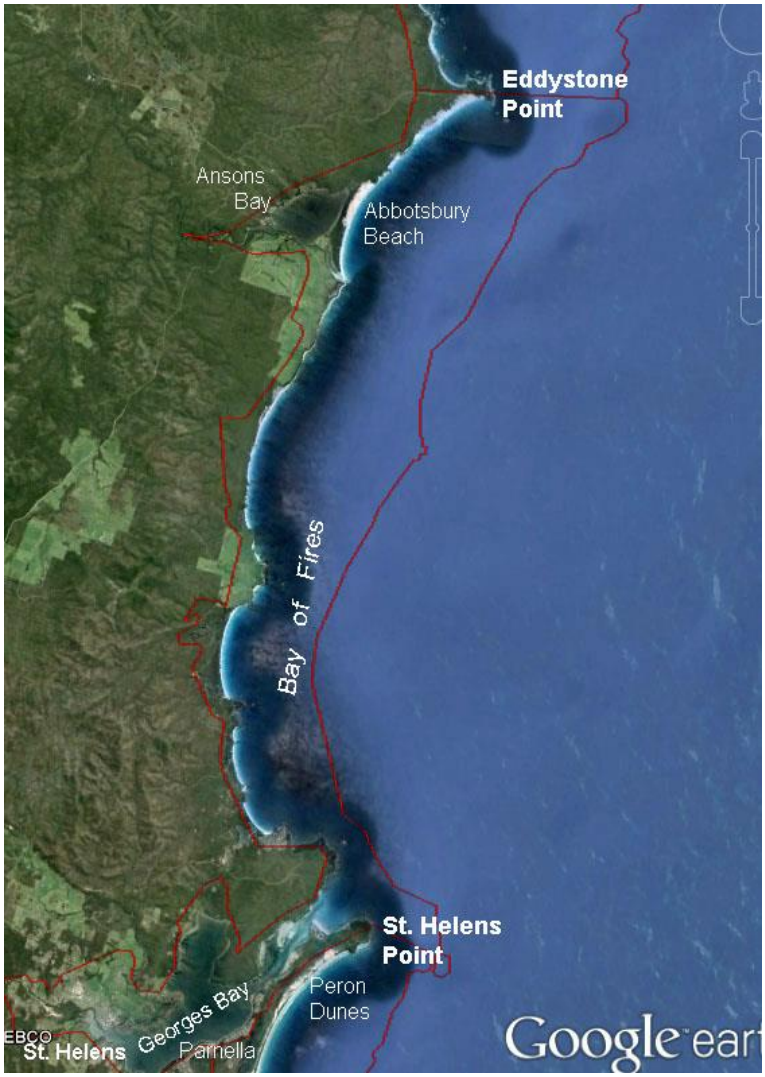

Figure 1: *Compartment TAS01.02.02 Bay of Fires.*

Figure 2: *Abbotsbury Beach is backed by active transgressive dunes but like other open coast beaches in this compartment, it is showing no sign of progressive shoreline recession to date. Photo by C. Sharples (2002).*

Figure 3: *View from the waterline, looking up the slumping Tertiary clay shoreline at Parnella, in Georges Bay. The old horizontal shoreline road surface in the foreground has provided some protection from wave attack at the toe of this slope, but is itself being eroded by wave action. Photo by C. Sharples (2013).*

Figure 4: *A progressively receding shoreline erosion scarp in semi-lithified Pleistocene fluvial sands on the north-west shore of Anson's Bay. Similar erosion has threatened numerous shacks on the Anson's Bay shoreline in recent decades but, in parts, has been prevented by artificial protective structures. Photo by C. Sharples (2013)*

Confidence in sources

Medium confidence: Based on existing published geological mapping, and on field observations by C. Sharples. Little useful systematic information is readily available, except as noted below.

Additional information

There have been a number of unpublished (and generally difficult to access) consultant reports prepared on coastal erosion, slumping, flooding and sand bar hazards in Ansons and Georges Bays. With the exception of landform and slump mapping at Parnella by Mineral Resources Tasmania, there has been little systematic study or publically-available data on these issues to date.

The following references are referred to in the text 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.

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.