Western Port VIC03.01.06

Regional Setting

This compartment extends from Point Grant to West Head.

The southwest-facing mouth of Western Port is directly exposed to south-westerly swells, which are a strong influence on shoreline processes, at least as far as Sandy Point and Cowes. However, inner shores from Tooradin to Settlement (Corinella) Point receive little swell and are dominated by locally-generated wind waves.

Western Port has a micro to meso-tidal range of up to 2.3m, and tidal currents are probably a significant influence on sediment transport. Particularly energetic tidal currents occur in the narrow passage between Philip Island and the mainland at San Remo.

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 is variable: Sandy spit shores are likely to be late responders to sea-level rise (rating 3); mangrove shores are likely stable to medium term receding (rating 3 to 4); soft rock-shores are likely to be early responders (rating 5); hard rock cliff shores are mostly resilient.

Womersley et al. (2014a) identified seven distinctive shoreline geomorphic types within Western Port, in respect of their likely physical response to coastal processes and sea-level rise. Womersley et al. (2014a) should be consulted for more information about each of these.

Prograded “sandy spit shorelines” west of Sandy Point, on the north side of Philip Island and elsewhere, exhibit cyclic erosion and accretion relating to alongshore sand transport and sand lobe migration. Sediment transport modelling suggests there is likely to be some continuing sand supply from the Bass Strait to these shores (Harris & Heap 2014). Whilst it is difficult to determine how these complex sandy systems may respond to sea-level rise (Womersley et al. 2014a), it seems likely that some ongoing sand supply will minimise the potential for non-cyclic shoreline recession for some decades at least, making these shores likely late responders to sea-level rise.

In contrast, “low earth cliffed shorelines” and “high cliffed soft rock shorelines”, at Jam Jerrup, Lang Lang, Corinella (Settlement) Point and elsewhere in swell-sheltered eastern Western Port, are already progressively receding in response to local wind-wave storms and are likely to continue or accelerate their recession in response to ongoing sea-level rise. These are probably early responders to sea-level rise.

Extensive muddy mangrove shorelines in the Hastings and Tooradin regions are likely to eventually retreat landwards with rising sea-levels and, in many areas, may be squeezed out against steeply rising backshores. However, there is some uncertainty over the capacity for sediment deposition and sub-surface organic production in the mangrove ecosystems to increase surface elevations and ‘keep up’ with sea-level rise. Examination of ortho-rectified air photos of mangrove shorelines at Tooradin between 1968 and 2011 showed little change in shoreline position in most places, with possible minor accretion in a few locations (C. Sharples, *unpublished*). This suggests that the mangroves have been keeping up with sea-level rise in the Tooradin area to date, and hence may be medium-term to late responders to sea-level rise (in terms of shoreline recession. They may be early responders in a different sense if they prove to have the capacity to keep up with sea-level rise).

Hard basalt cliffs are prominent immediately west of Western Port, between Cape Schanck and West Head, but also occur at a number of locations within the compartment. These are generally resilient, although some increase in cliff slumps may occur in response to sea-level rise.

Other comments

Because Western Port includes a diversity of differing coastal landforms and process environments, some shores within this compartment respond quite differently to coastal processes and sea-level rise than others. It is, therefore, not possible to provide a simple characterisation of the likely response of this whole compartment to sea-level rise, and different parts of Western Port must be considered independently, depending on their landform types and process environments. Womersley et al. (2014a) provides the most recent comprehensive assessment of likely physical responses of shorelines to coastal processes and sea-level rise in the differing parts of Western Port.

Substantial areas of the Western Port shoreline and backshore areas are also subject to inundation hazards including co-incident catchment flooding hazards (Womersley et al., 2014b)

Confidence in sources

High confidence: Based on detailed studies.

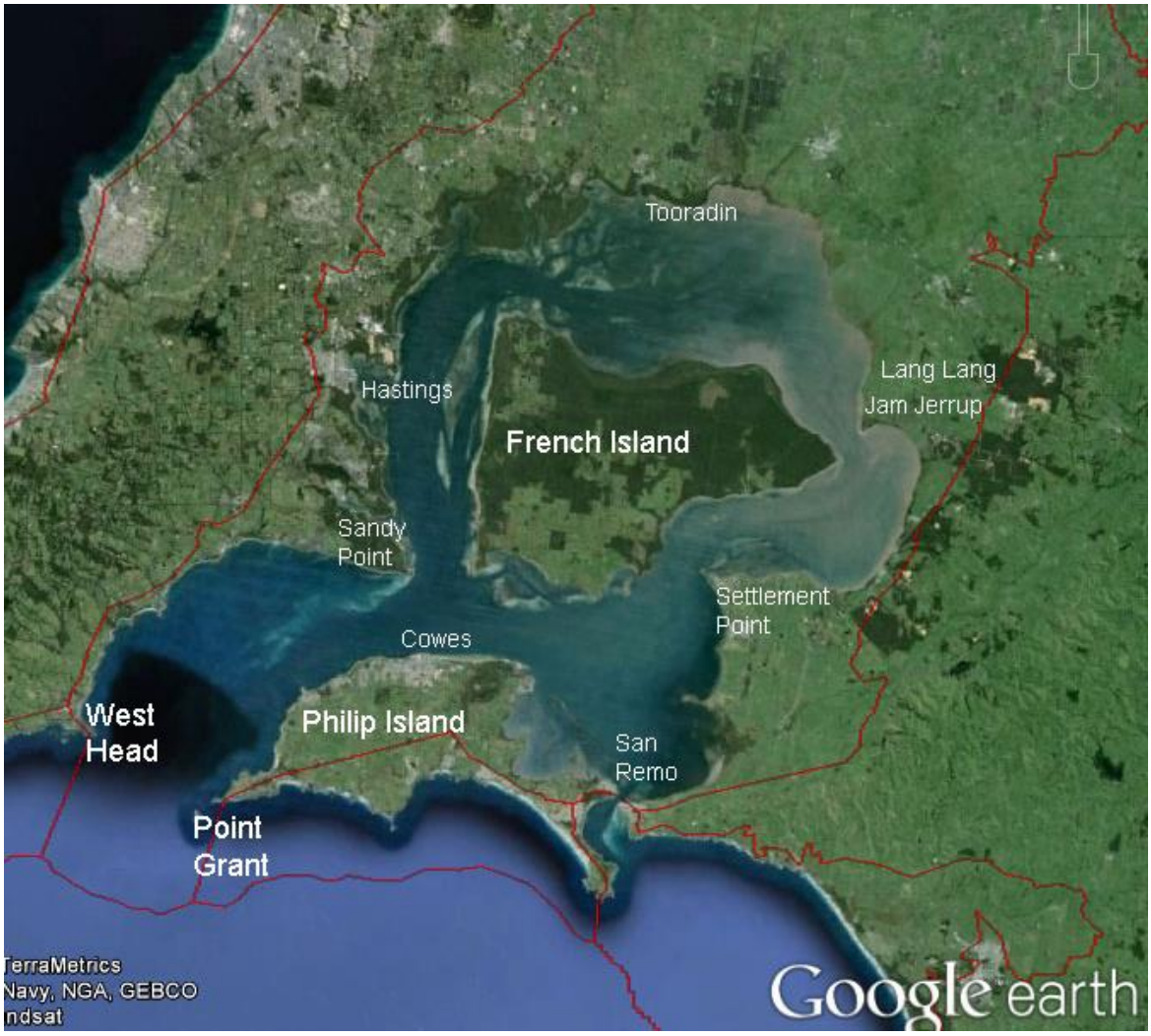

Figure 1: *Compartment VIC03.01.06 Western Port.*

Figure 2: *This actively receding cliffed "semi-lithified" soft-rock clayey sandstone shore at Jam Jerrup is already progressively receding without recovery and its recession is likely to accelerate with ongoing sea-level rise. Photo C. Sharples (2010).*

***Figure 3**: These muddy mangrove shores at Tooradin (seen here at low tide) have maintained a constant shoreline position since 1968 despite a rise in sea-level since that time, and may be doing so because sub-surface organic production and muddy sediment capture is keeping up with sea-level rise to date. Photo by C. Sharples (2010).*

Additional information (links and references)

Western Port is a relatively well-studied coastal environment for which there are a significant number of relevant previous studies available. No attempt is made to provide a comprehensive bibliography here. However, a recent Local Coastal Hazard Assessment report for Western Port by Womersley et al. (2014a), as listed below, provides a summary of previous work and an assessment of erosion and shoreline recession hazards.

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.

Womersley, T, Arrowsmith, CL, Mawer, J, Rosengren, N, Boon, P, Hinwood, J & Tilleard, J 2014a, *Western Port Local Coastal Hazard Assessment: Report 05 (R05) - Erosion Hazards*, Report by Water Technology Pty. Ltd. for Melbourne Water, Melbourne, Victoria

Womersley, T, Mawer, J, Arrowsmith, CL & Others 2014b, *Western Port Local Coastal Hazard Assessment: Report 4 (RO4) - Inundation Hazards*, Report by Water Technology Pty. Ltd. to Melbourne Water.