PORT GEOGRAPHE LANDOWNERS ASSOCIATION INCORPORATED

PO BOX 1456
BUSSELTON WA 6280

Submission to the Port Geographe Technical Working Group

by
R Dennis Gee BSc (Hons), PhD, MAIG
RC McDavitt Assoc WAIT, FIE Aust
Geoff Cocks BE (Hons), MSCE, FIE Aust

On behalf of
Port Geographe Land Owners Association
5 February 2020

The beaches of Geographe Bay are susceptible to inconvenient accumulations of sea-grass wrack, especially after winter storms. This is an inevitable natural phenomenon because of the immediate proximity to one of the largest shallow sea-grass meadows in Western Australia. Geotechnical and exploratory drilling show the seagrass meadow has been shedding wrack for thousands of years. Contemporary historical observations are that winter accumulations are omnipresent on all beaches, but can be larger against natural and artificial discontinuity features of the beach-line. Accumulations mostly disperse naturally by December each year.

After the initial development of Port Geographe in 1997 there were seasonal wrack accumulations particularly against the initial western breakwater because of its orthogonal orientation and the anti-clockwise littoral circulation. Natural by-passing was impossible. Accumulations of the magnitude 115,000m^3 to 150,000m^3 pa were recorded against the western breakwater in the period 2011 - 2013. The study by Oldham *et al* (2010) estimated that 97% of all beach wrack was accumulated against the western breakwater.

These un-natural accumulations were of sufficient nuisance value to warrant re-configuring the port breakwaters, which became effective December 2014.

Bi-annual reviews are made by Department of Transport (DoT) in accordance with the Port Geographe Coastal Structures Environmental Monitoring and Management Plan 2016-2020. This covers the coastal stretch from Morgan St in the west, past Port Geographe, to Baudin Reserve at the eastern part of Wonnerup Beach. This is the Port Geographe Coastal Management Area, for which Port Geographe landowners pay a Special Area Rate for coastal management.

DoT has provided periodic updates on performance of the re-configured breakwaters. www.transport.wa.gov.au/portgeographe. Unfortunately they contain very little quantitative data on sand and wrack accumulations, other than to opine that wrack

volumes are significantly less than peak winter values pre-reconfiguration, and are below the trigger volumes for obligatory remedial action.

In the context of continued criticism of breakwater performance, and in the absence of published quantified data by DoT, we three professional members within PGLOA, with expertise in science and engineering, have undertaken a technical study of the Western Beach. The report is on the PGLOA website at: http://portgeographe.com.au/coastal-management/.

Our study is based on ancestral coast lines going back to 1941 that have been captured from the Slip website https://maps.slip.wa.gov.au/Marine/app/. Also the Coastal Department of DoT has kindly provided geo-referenced aerial photo mosaics of the coastal strip, some as old as 1941. Time-series satellite imagery back to 1985 is available through Google Earth Pro. We also use the 2017-18 images of Western Beach provided by Busselton City Council. All of these datasets have been registered into MapInfo GIS software.

We have also read the publically available technical reports on coastal sand and wrack process by consultants, and find them technically excellent within their scope. However they are deficient in that they fail to consider historical data which is critical to understanding the dynamics of sand and wrack movements.

The main conclusions of our study are:

1. The natural beachlines of Geographe Bay are characterised by a series protruding nodes and gently scalloped embayments; these are historic features that grow seaward by natural beach accretion.
2. Historic aerial photos show the nodes have been in existence for at least 75 years and have not moved laterally.
3. The beaches on either side of Port Geographe lie within a natural embayments that display the highest sand accreting rates in Geographe Bay - generally 12 metres per decade.
4. Since the breakwater realignment in Dec 2014, accretion along the Western Beach between Lesueur Close and Guerin St is **ten times** the regional rate, ranging from 12 to 17 metres per year.
5. Based on quantitative volumetric estimates of sand accreting rates, and known sand flux rates, Western Beach could reach dynamic equilibrium by late 2020.
6. The ideal beach shape will be a gentle embayment between the tip of Western Breakwater and Russell Street Node; its shape will mimic that of previous nodes and embayment going back to 1941, but will be displaced seaward, not laterally.
7. The new equilibrium shape will enable natural by-passing of both sand and wrack past the western breakwater.
8. Accumulated wrack plays an important role in assisting the build-up of sand into the elbow of the beach-breakwater interface, and promoting new vegetation at the beach head.
9. The equilibrium profile will still be subject to seasonal wrack accumulation and dispersal processes as found elsewhere around Geographe Bay; these natural accumulations have occurred in the years well before the initial development of Port Geographe.
10. Interventions involving sand and wrack movements by machinery are not necessary to enhance the build-up of beach material to achieve natural by-passing.

Point 6 above is particularly relevant to Western Beach. It will always be a gentle embayment that will attract wrack accumulations, as it has done for decades prior to the initial development of Port Geographe. In terms of wrack management, there is no point in filling the embayment with sand to form a straight line between the Russell St and Western Breakwater nodes. It will naturally revert to a gentle embayment, because the shape of Western Beach is controlled by proximity to near-shore oblique sandbars.

Figure 1: Western Beach between Russell Node and Western Breakwater showing historic shorelines and 2018 wrack

Contrary to some unwarranted criticism, we believe the reconfigured breakwaters are performing well in terms of coastal management. The design of the reconfigured breakwaters was based on the best available science at the time supported by extensive stakeholder consultation. Mechanical interventions such as beach nourishment around Port Geographe are not necessary. However it is acknowledged that limited mechanical operations in November 2018 and December 2019 have improved the beach amenity of local residents. Such activity is supported as it is analogous to the publically funded winter wrack-removal programs by BCC around the Jetty Node.

A corollary of our study is that once natural by-passing is achieved there will be a build-up of sand at the port entrance. We believe this will require bi-annual dredging into the future.

Repeated statements that Port Geographe development is the cause of abnormal wrack accumulations, beach erosion and fetid odours are erroneous. In particular we reject assertions that the reconfiguration of the breakwaters is a failure.

For further information please contact Dennis Gee dennis.gee@bigpond.com