CONCEPT DESIGN PRESENTATION

COMMUNITY REFERENCE GROUP MEETING, 18TH MAY 2021

Phase 2 Impact Assessment Overview

Doug Lord, Director & Principal, Coastal Environment Pty Ltd

PURPOSE OF OUR ENGAGEMENT

Analysis

- Review of previous reports focussing on DHI 2018 and Water Technology 2020.
- Check beach profile assessment by others and update that assessment.
- Undertake preliminary review of satellite imagery data.

Impacts

- Qualitative/quantitative assessment of the long-term impacts on beaches and dunes between West Beach and Largs Bay of proposed back-passing scenarios.
- Comment on ecological and social impacts from an engineering perspective.
- Provide qualitative risk assessment and identify mitigating measures where warranted.

BACKGROUND

- Sand has been moving from south to north through the Adelaide beaches driven by waves from the south, since sea level stabilised some 5,000 yrs B.P. (Prof A.D. Short).
- Since European settlement, development has occurred along the coast, intersecting the steady flow of sand and causing realignment of the beach in response. Every activity on the coast will cause a change elsewhere.
- Development, infrastructure and services have at many locations been placed too close to the active beach. These decisions were made many decades ago. Socially and economically, they are now irreversible.
- The beach alignment is changing in response to both development and beach management. This is often manifest suddenly during storm events.

BACKGROUND (2)

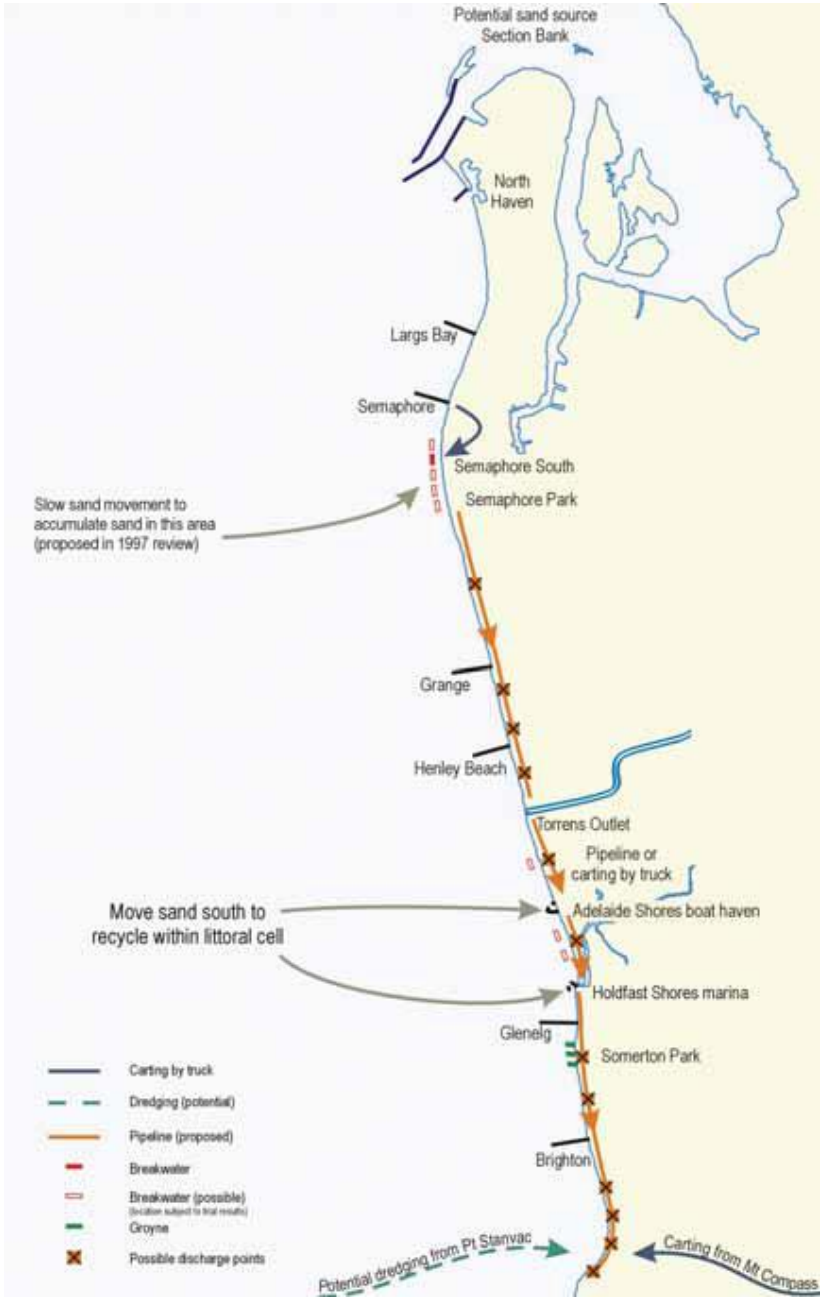
- Our understanding of the beach behaviour and beach response is informed by casual observation, structured data collection and modelling. All are legitimate.
- In Adelaide there is an excellent long term survey data set of beach profiles dating back about 50 years, which is invaluable. It is used to assess beach change and inform modelling and decisions.
- Wave conditions and alongshore sand transport rates have been increasingly estimated by numerical modelling since the 1990s.
- Recent advances in GIS and data collection (drones, lidar and lads survey) provide new opportunities for relatively cheap and detailed data collection on beach and nearshore evolution.

SOME PREVIOUS ASSESSMENTS

- "*Adelaide's Living Beaches. A strategy for 2005 to 2025*" Department for Environment and Heritage, December 2005.

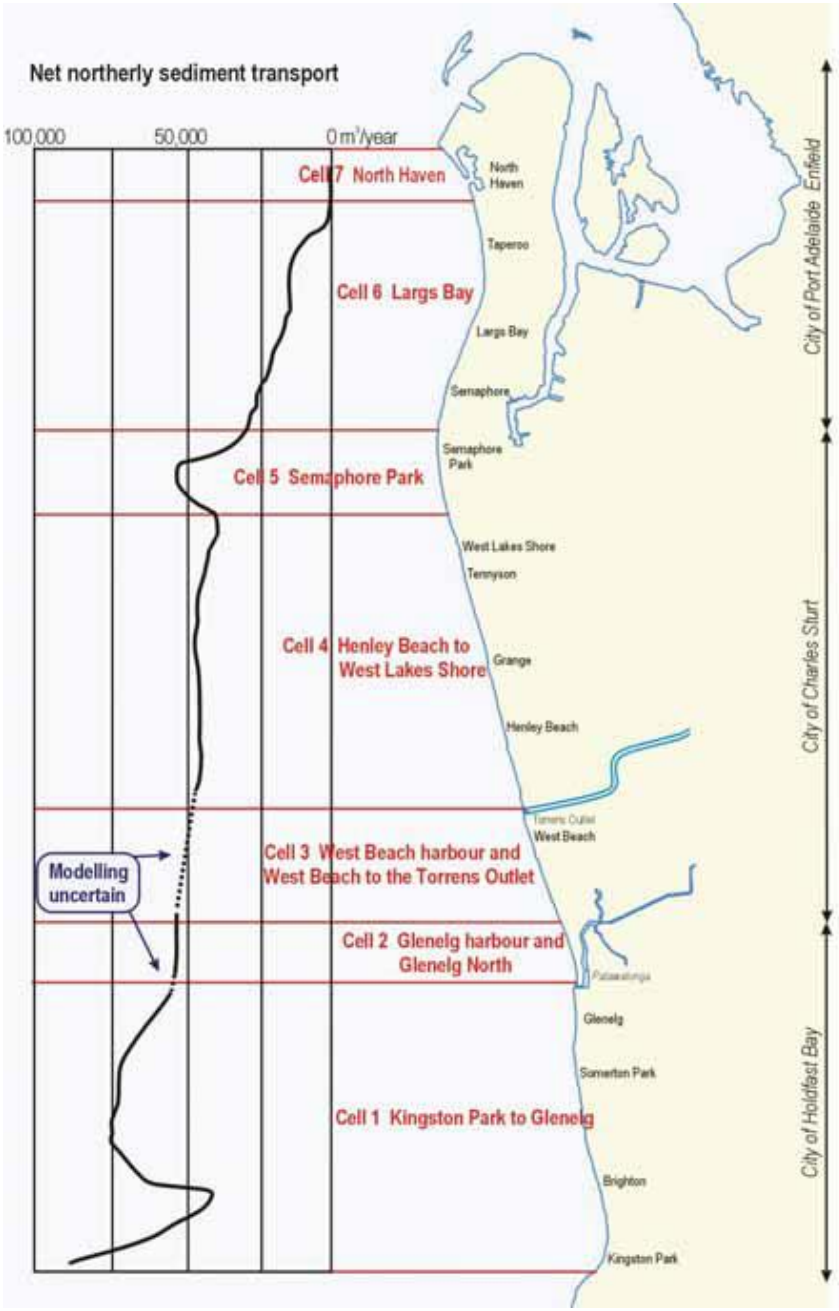
- "*West Beach Coastal Processes Modelling. Assessment of Coastal Management Options*" DHI, August 2018.

- "*Impact Assessment of Moving Sand from Adelaide's Northern Beaches – Phase 1 Assessment: 2020-2021 Sand Movement*" Report by Water Technology, December 2020.



Adelaide's Living Beaches

- Beach divided into 7 management cells.
- Management option 10, "*the fusion approach*" selected for managing sections of the coast with sand recycling and/or minor replenishment and sections of the coast with structures.
- This was effectively an upgrade of the management approach at the time in a more structured manner to reduce costs through efficiency.
- To be implemented over 5 years 2005 to 2010.
- The Adelaide beaches have changed irreversibly and the management of the beach in discrete sections is the most effective approach.



DHI 2018 - COASTAL PROCESSES

- Net alongshore sand movement is estimated at between 50,000 and 150,000 m^3/yr, with an average rate of around 100,000 m^3/yr. This is much higher than the previous estimates on which the West Beach boat harbour and sand bypassing were designed in the mid to late 1990s.
- The West Beach sediment cell has lost around 500,000m^3 of sand since the late 1990's and this loss rate has accelerated since approximately 2011. Sand lost is being transported from West Beach and to a lesser extent the Henley Beach cells and eventually accumulating in the northern most sediment cells, the end of the alongshore drift system.
- No significant sand volumes are being lost offshore and there is no significant natural bypassing around the West Beach boat harbour today.

DHI 2018 - COASTAL PROCESSES (2)

- A sustainable longer term solution to maintain a stable, sandy beach alignment at West Beach must include some form of ongoing nourishment at a rate of around 100,000 m^3/yr on average; otherwise, the erosion problems will continue to worsen and migrate northwards into the Henley Beach cell.
- While the beach is managed as cells, the cells between the West Beach boat harbour and North Haven are not closed to alongshore transport i.e. sand can continue to move north from cell to cell, in response to wave action.
- Assessed sand transport rates are **averaged over an extended time period**, generally expressed in m^3/yr. In practice, transport tends to be dominated by events. One years average transport can occur in one month or a few days.

WATER TECH.- PHASE 1 ASSESSMENT

- Movement of up to 120,000m^3 of sand in the 2020-21 financial year to West Beach from beaches between Semaphore Park and Largs Bay.
- Sand to be collected by land plane (scraper) from the beach between the low water mark and 5m from the toe of dune - also noting the requirement in Section 3.3 to consider alternative offset distances from the toe of dune (5m, 10m and 15m).
- Sand to be moved by truck along the beach to the existing beach access point at the Semaphore Surf Life Saving Club (Point Malcolm Reserve), where it will be loaded onto road haulage trucks and transported to West Beach.

WATER TECH.- PHASE 1 ASSESSMENT (2)

- Future sand harvesting campaigns at the Semaphore breakwater should be no more than the natural rate of sand replenishment, to **limit** further downdrift impacts.
- Beach conditions shall always be assessed prior to each campaign to ensure that sufficient volumes are available.
- A maximum quantity of about 60,000 m^3 can potentially be harvested from the area in between Semaphore and Largs Jetty and a maximum of 85,000 m^3 from North of Largs Jetty in 2020/21.

SUMMARY

- DHI 2018 conclude that alongshore sand transport rates at West Beach are higher than previously believed (50,000m^3 to 150,000m^3 per annum).
- This has resulted in a reduction in sand volumes between the West Beach boat harbour and the Torrens entrance of 500,000m^3 since the harbour construction.
- Within a beach cell, erosion/accretion of the visible beach above the low water mark (beach width and dunes) are reflected in beach volumes. For the beach to remain in a dynamic equilibrium, sand movement into the cell **plus** sand nourishment placed in the cell (either from an external source or by back-passing from a downdrift cell) should equal sand volume moving out of the cell (to the north) under wave action **plus** any sand removed artificially from the beach (back-passing to the south or extraction for other purposes).

SUMMARY (2)

- The Adelaide beaches have changed irreversibly and the management of the beach in discrete sections (cells) is now the most effective approach.
- Balancing the sediment budget within a cell requires frequent and detailed monitoring of the changes and the impacts of activities in real time. Every action will result in a change in the sediment volumes elsewhere in the cell or further downdrift over time.
- The sand that has accumulated and continues to accumulate north of the Semaphore jetty to North Haven over many decades/centuries has been transported by waves from the beaches further south.

SUMMARY (3)

- Small and frequent responses are preferable to large scale interventions. A sand pumping system with multiple inlet and outlets can provide flexibility to managing the beach.
- Successful sand management is dependent on detailed and frequent monitoring of beach conditions. Decisions on sand removal and sand placement must be governed by measurement of beach response.
- At sand sourcing locations, safeguards should be in place to ensure that beach stability is not affected by excessive extraction (e.g. minimum beach volumes, beach width , berm height etc.).

CONCLUSIONS

- The coastal processes along the Adelaide beaches have been irreversibly changed since European settlement by development and by climate variation.
- Sand traditionally moved from south to north through the area from Onkaparinga to Port Adelaide. This alongshore drift is now interrupted by structures, realigning the beaches to a new sediment balance.
- The further north that sand is sourced for back-passing, the less adverse impacts will be caused on the beach downdrift of the sourcing.
- While sand existing within the system can be managed carefully, external sand sources will be required into the future to maintain the current beaches and their alignment.
- Climate change will bring further challenges as sea level rises, shorelines respond and alongshore sand supplies alter in future decades/centuries.


QUESTIONS?