Ashfield Flats—A Hydrological Study

Ashfield Flats Reserve is the largest remaining river-flat in the Perth Metropolitan area. A Bush Forever Site listed in the Directory of Important Wetlands in Australia and federally listed as a Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community (TEC) under the *Environment Protection and Biodiversity Conservation* Act (1999). The Department of Planning Lands and Heritage (DPLH) funded the Department of Biodiversity, Conservation and Attractions (DBCA) to undertake a Hydrological Study identifying the hydrological processes at the Reserve.

Study Objectives

- Conduct a monitoring program to measure aspects of hydrology
- Model water levels, flows and water quality to estimate water balance components
- Investigate pollutants in soil and groundwater, and their potential sources.

Site Pressures

- Urbanisation
- Pollution
- Weed invasion
- Population pressure and
- Climate change induced sea-level rise.

Site conditions specific for a Saltmarsh TEC

- Ecological processes in saltmarsh ecosystems rely on seasonal inundation.
- Evapotranspiration of the estuarine water produces the hypersaline conditions within the flats (Figure 2).
- Halophytes (the dominant salt marsh plants) are sensitive to changes in salinity and the duration of submergence.

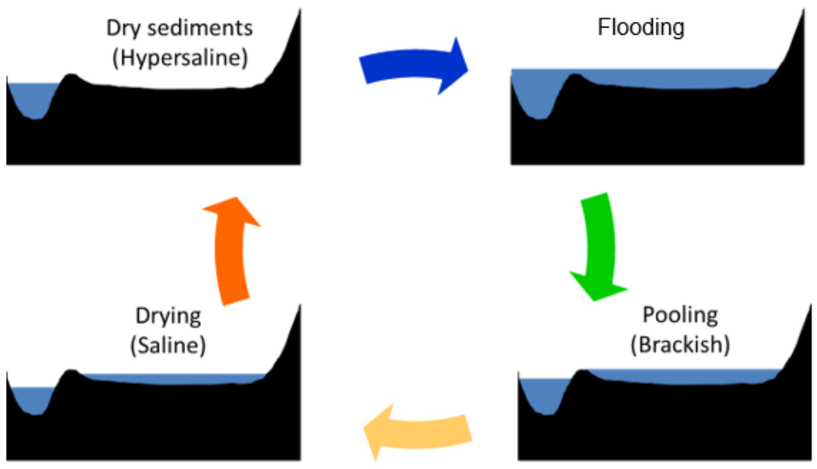

Figure 2: *Conceptual model for the current river-wetland interactions.*

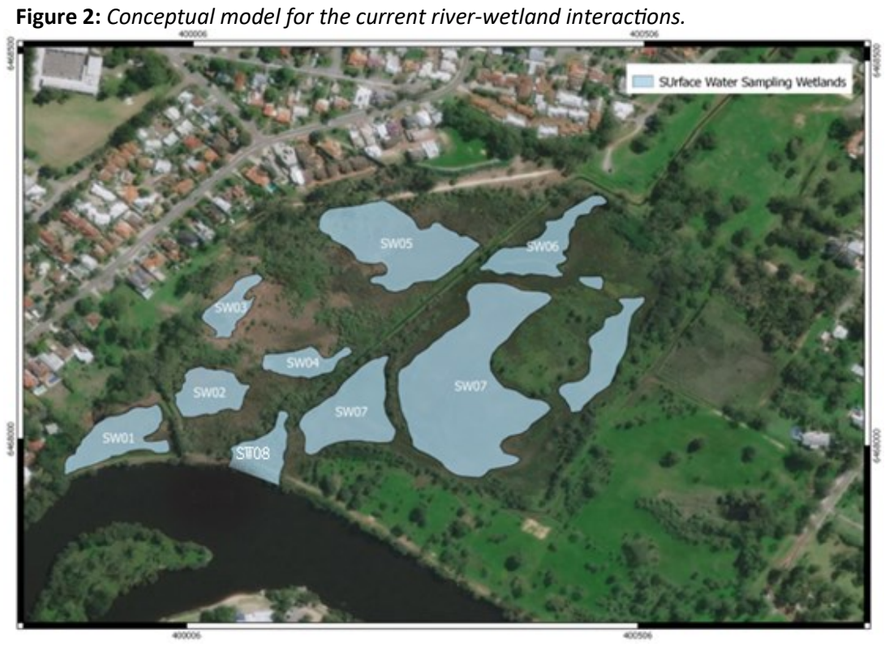

Figure 3: *Surface water pools within the wetlands*.

Recommendations for site management

Ashfield Flats is a significant community asset that will need considerable community consultation for future management-to achieve an ecological best management approach that considers:

- Forecasted rise in river water levels and increasing inundation of the foreshore. As such it is recommended to allow room for the river. This involves the establishment of native vegetation along the foreshore to reduce erosion as inundation events increase.
- The Salt Marsh TEC community extent will alter and may retreat, where space is available, towards the east of the reserve. Space should be made available for this retreat to occur.
- Any drainage intervention designed to improve the quality of stormwater discharge will need to consider existing contaminants and be set above the projected inundation levels, to remain viable.

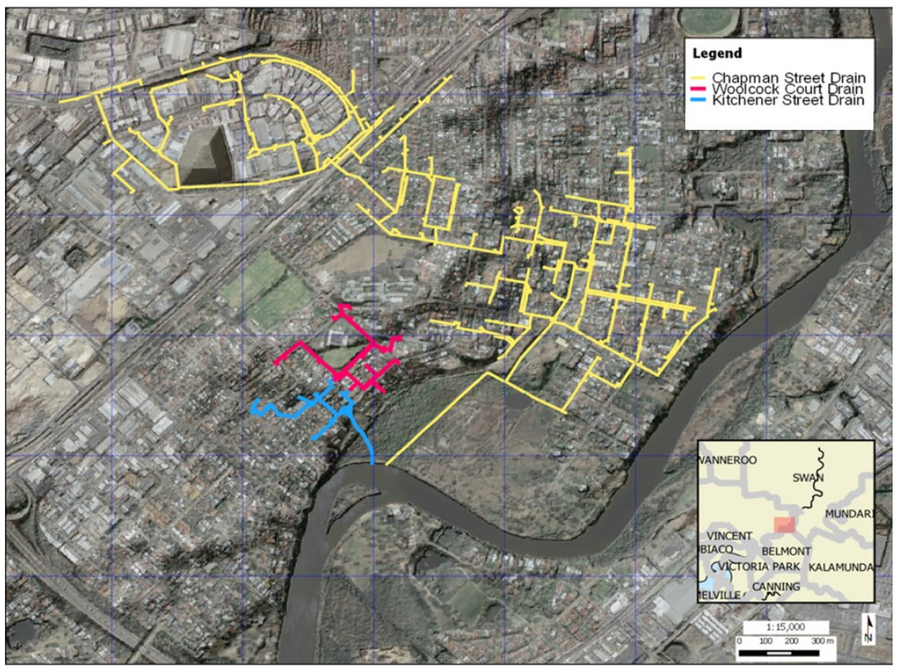

Figure 1: Ashfield Flats catchment drainage features

There is limited interaction between storm water passing through the Chapman Street and Kitchener Street drains, and the surrounding salt marsh. Most stormwater directly discharges to the river, except during high tide events. The Woolcock Court Drain discharges directly into the western side of the flats.

Key learnings from this study

- The river level is the main driver in the hydrology of the wetland.
- The wetland system is expected to switch from an ephemerally wet salt flat to a brackish system, permanently flooded and connected with the Swan River within 70 years. It is unknown whether the wetland can build up sediments and materials to keep pace with this change.
- The changes to submergence and salinity will start to alter the ecology of the site within 20 years, placing pressure on the halophytes species.
- The Woolcock Court drainage system (see Figure 1) appears to perform two functions, stormwater drainage and groundwater lowering. This drain has a constant base flow of water with elevated nutrient levels discharging into the western side of the flats.
- The construction of the Woolcock Court Drain has led to a freshening of the wetland pools on the western side of the TEC and contributed to a more perennially inundated state (SW03 in Figure 3). It has also influenced the type of vegetation on the western side of the site (Figure 4), with the establishment of Eucalyptus and Melaleuca communities in areas of lower salinity.
- There is a limited interaction between the local groundwater and the wetland, with evidence of polluted groundwater being transported into the wetlands via urban drainage. This pollution is consistent with acidified groundwater associated with the manufacture of fertilisers and sulphuric acid.
- The wetland is trapping and storing heavy metals and providing treatment of high nutrient levels in the stormwater from Woolcock Court Drain, before it discharges to the Swan River. High nutrient and metal concentrations within Chapman Street Main Drain and the Kitchener Street Main Drain discharge directly into the Swan River.

Figure 4*: Current distribution of vegetation units*

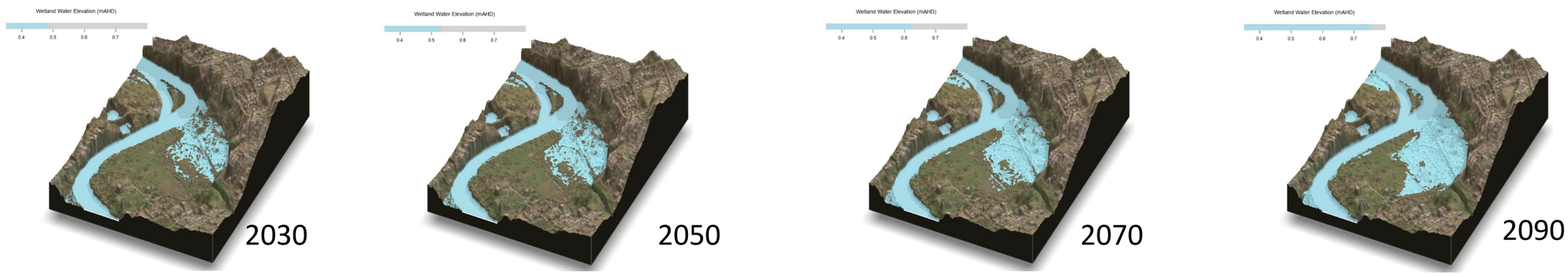

Figure 5: Potential impact of climate change and rising sea-level on Ashfield Flats. The maps show the *spatial extent of average inundation at IPCC emissions Scenario RCP8.5 for the periods 2030 to 2090 .*

We need to plan for this change over time. Community consultation and Master Planning to start in 2022.

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