

Adelaide Desalination Plant Intertidal Monitoring

Progress Report

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1 Introduction

General operational and environmental monitoring objectives were outlined in the 2008 SA Water EIS for the construction of the Adelaide Desalination Plant project, which encompasses the implementation of environmental monitoring during the pre construction, construction and full operation phases (Proposed Adelaide Desalination Plant Environmental Impact Statement, available at URL: <http://www.sawater.com.au/SAWater/WhatsNew/MajorProjects/EIS.htm>; accessed 27-07-2011). Environmental monitoring of the rocky intertidal zone involved an assessment of invertebrate and algal communities. Rapid survey of the intertidal rocky shores was undertaken using the photoquadrat and video transect methods (Baring et al. 2010; Dutton & Benkendorff 2008; Benkendorff and Thomas, 2007).

The investigation was conducted to establish a baseline dataset for intertidal communities along the coastline of Gulf St. Vincent, collected across the Port Stanvac Construction Zone and North and South Control Zones. This dataset will allow the evaluation of potential impacts associated with the operation of the Port Stanvac desalination plant with future monitoring. The data and analysis within this progress report is specific to the intertidal monitoring for the Summer period of 2012.

2 Methods

2.1 Sampling Locations and Sites

Sites along the Fleurieu Peninsula were selected according to comparable strata type and topography. Five locations within the Port Stanvac fenced area were sampled with reference locations to the North at Marino Rocks and Hallett Cove and to the South at Carrickalinga, Second Valley and Fisheries Beach (Figure 1). Two 20 x 20 m plots were surveyed within the intertidal zone at each location, thus generating data from 20 specific sites. All sites were sampled in January 2012 (Table 1), using each of the methods outlined in previous reports (Baring *et al.* 2010).

2.2 Invertebrate Abundance

Photoquadrats were used to assess invertebrate abundance, species diversity and species richness as this method can be rapidly applied in the field and provides a permanent record for future reference (Baring *et al.* 2010; Dutton and Benkendorff, 2008).

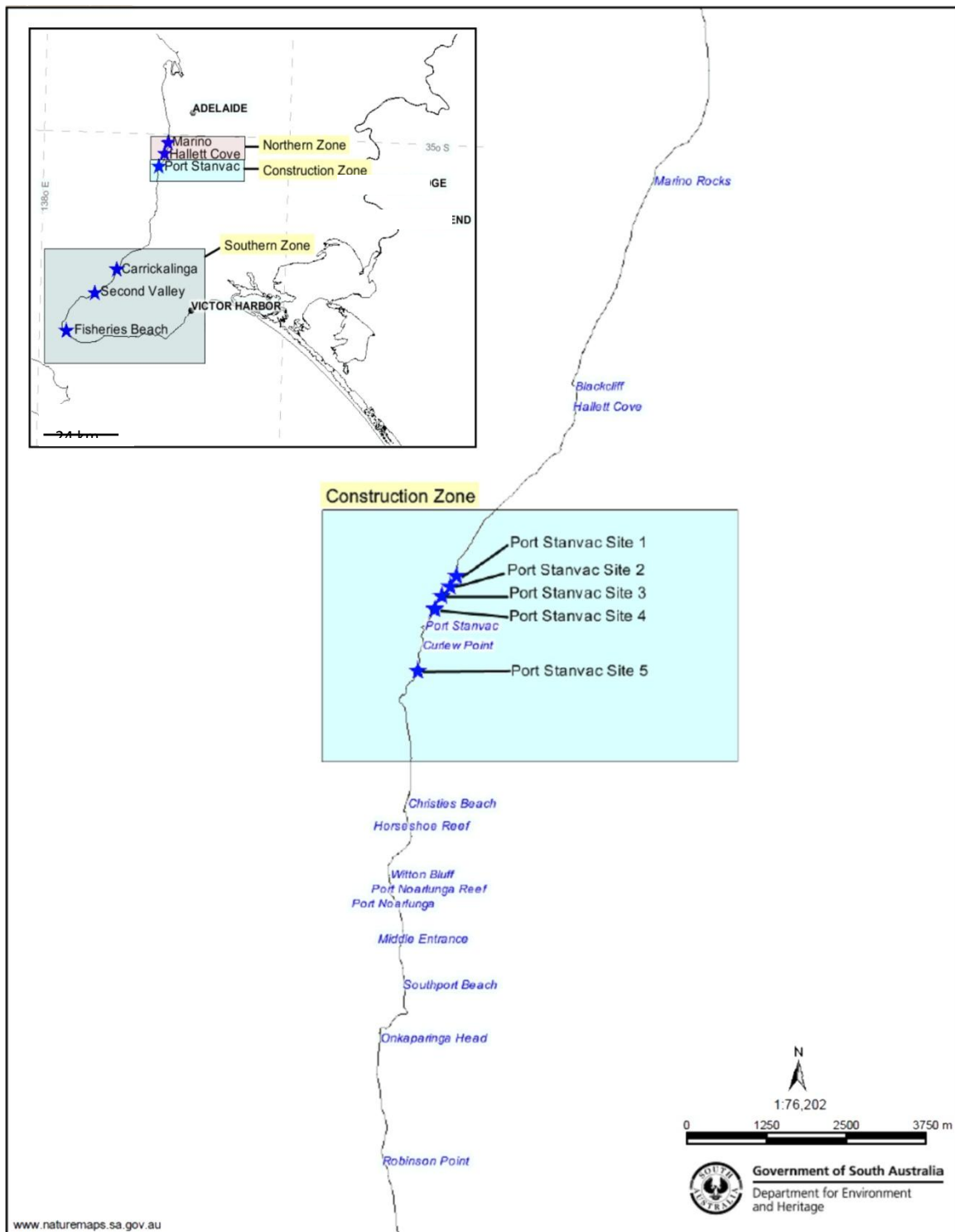


Figure 1: Intertidal sampling sites for the (a) Port Stanvac Construction Zone, Northern Reference Zone and Southern Reference Zone during Summer 2012 (b) magnified snapshot of the five Sites within the Construction Zone for the Summer 2012. Maps adapted from Nature Maps, Department of Environment and Heritage, Government of South Australia, www.naturemaps.sa.gov.au

Table 1: Sampling dates and GPS co-ordinates for the intertidal study sites sampled during summer, January 2012

Location	GPS Co-ordinates		Season	Date	Tidal Height (m)
	South	East			
Marino Rocks	S 35°02'45.6"	E 138°30'27.6"	Summer	MR1: 27/01/2012	0.17m
				MR2: 12/01/2012	0.13m
Hallett Cove	S 35°05'06.2"	E 138°29'31.5"	Summer	12/01/2012	0.13m
Port Stanvac 1	S 35°06'48.8"	E 138°28'13.5"	Summer	24/01/2012	0.23m
Port Stanvac 2	S 35°06'28.4"	E 138°28'20.0"	Summer	25/01/2012	0.22m
Port Stanvac 3	S 35°06'15.4"	E 138°28'31.8"	Summer	25/01/2012	0.22m
Port Stanvac 4	S 35°06'12.4"	E 138°28'34.4"	Summer	23/01/2012	0.22m
Port Stanvac 5	S 35°06'25.7"	E 138°28'20.7"	Summer	13/01/2012	0.18m
Carrickalinga	S 35°25'09.0"	E 138°19'25.2"	Summer	11/01/2012	0.12m
Second Valley	S 35°30'36.3"	E 138°12'54.2"	Summer	9/01/2012	0.18m
Fisheries Beach	S 35°37'58.5"	E 138°06'49.4"	Summer	11/01/2012	0.12m

2.3 Percent Cover of Sessile Organisms

The line intercept transect method (e.g. Benkendorff and Thomas, 2007; Dutton and Benkendorff, 2008) was used to assess the percent cover of sessile invertebrates as well as percent algal cover from the low to high tide zones. Video footage was taken of each replicate transect using an Olympus Model Tough 8000 digital camera (Baring *et al.* 2010). Algae were grouped into broad morphological categories (e.g. foliose, encrusting, and turfing) such as those used in Reef Watch surveys (Reef Watch, 2007). In regions where there was an overlap of sessile communities, 'mixed community' categories (e.g. mixed algal, mixed invertebrate) were established to represent and identify the presence of multiple species. Bare substrate and sediment cover was also noted along individual transects.

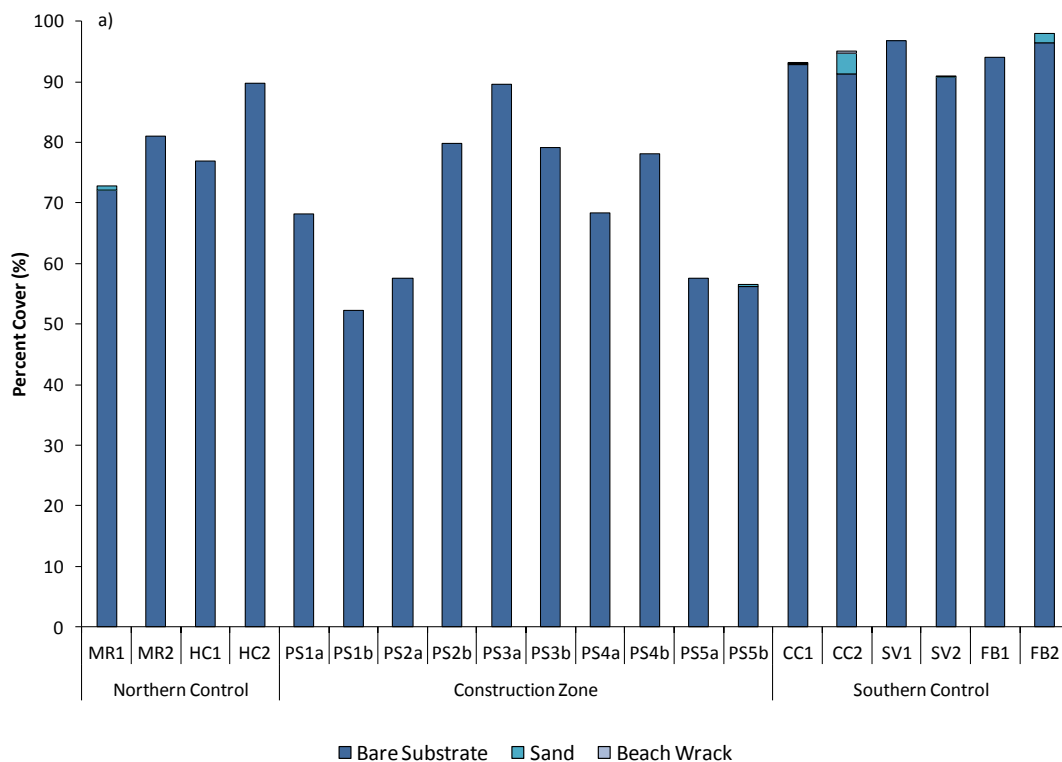
3 Results (preliminary)

3.1 Video Transects

3.1.1 Percent of Substrate Cover – Summer 2012

During summer 2012, the highest proportion of bare rock occurred within the Southern Reference Zone, with an average of 95% bare rock. In comparison, the Construction Zone had less than 66% bare rock cover. Sand cover was very low, occurring at only 6 sites across all three zones and accounting for only 5% substrate cover (Figure 2a).

Algal and sessile fauna cover was highest within the Construction Zone, particularly at sites PS5a and PS5b where there was more than 30% sessile fauna cover (Figure 2b). Barnacles were prominent at PS5b. Statistical analysis of the video transect dataset will allow for a more detailed insight into the Site to Site as well as between Zone variation in sessile flora and fauna cover and will be presented in the June 2012 report.



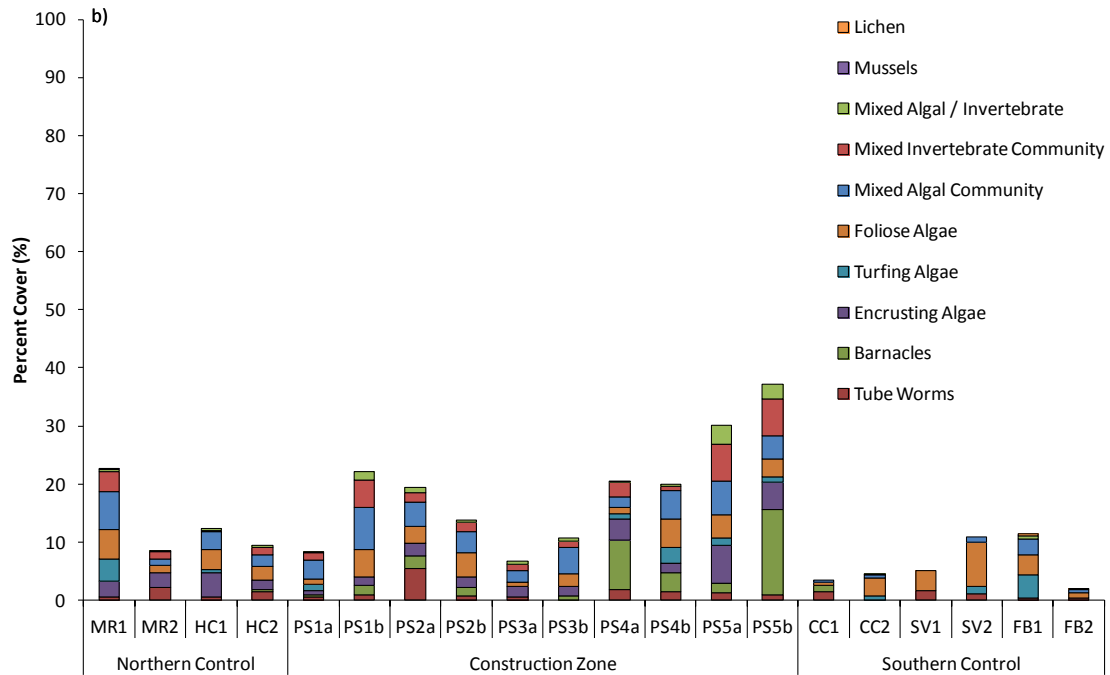


Figure 2: Mean percent cover of intertidal reefs, split into (a) bare substrate and sand and (b) algal and fauna quantified from transects. Based on intertidal reefs at all sites, across three Zones; Northern Reference Zone, Construction Zone and Southern Reference Zone during the Summer 2012 survey.

3.2 Photoquadrats

All photoquadrat data were collected during field trips throughout January 2012 (refer Table 1), with 200 quadrats being placed haphazardly across the low, mid and high intertidal zone generating 1,200 high resolution photos. All field work was conducted during tides ranging between 0.12 – 0.22 m. To date, approximately 70% of the photoquadrat data has been analysed with the remaining 30% to be completed along with data entry and statistical analysis and interpretation of the data set.

4 Preliminary Observations

4.1 Summer 2012

- The Southern Reference Zone had the least amount of flora and fauna coverage with an average percent cover of approximately 5% across the zone. By comparison the average percent cover across the Northern Reference Zone was 17% while the Port Stanvac Construction Zone continues to have the highest flora and fauna cover with an average of 47%.
- Preliminary observations from the summer surveys indicate that there is high variability in flora and fauna cover, species abundances and densities between the three Zones.
- Crustacea (barnacles) appear to be the dominant taxa within the quadrates with the construction zone having the highest abundance.

5 Overview of future work, data entry and analyses

At present the intertidal monitoring associated with the development of the Adelaide Desalination Plant is on track. All intertidal surveys have been carried out in the field and the data are in the final stage of analysis before statistical analysis and interpretation can begin. Please refer below for a brief outline of work to follow and to be included in the June 2012 intertidal report.

- Entry and organisation of Photoquadrat data and statistical analysis of the dataset.
- Three different measures of diversity indices will be calculated to determine the diversity and evenness of invertebrate species; Shannon-Wiener (H') and Simpson's Index and Pielou's measure evenness.
- PRIMER/PERMANOVA analysis of data to;
 - Determine significant differences between Zones and Sites
 - Analyse and compare ecological community datasets
 - Detect whether group differences contributed to any significance in the results
 - Analyse invertebrate community composition to determine similarities between Sites and Zones
 - Provide a visual pattern of invertebrate community structure and substrate structure using Principle Co-ordinates Analysis (PCO)
- Comparison of summer 2012 data with previous intertidal datasets to identify and interpret any temporal changes that may be occurring.

References

Baring R.J., Stewart T.D.C., Benkendorff K., (2010) Adelaide Desalination Plant final intertidal monitoring report. Flinders University, Adelaide.

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