9 RECOMMENDATION OF PREFERRED MANAGEMENT OPTION

9.1 Introduction

The analysis undertaken as part of this study has mainly dealt with potential long term management strategies for the area of Swansea Channel upstream of Swansea Bridge, particularly the area between Pelican Marina and the dropover. The analysis has provided us with an insight into the hydrodynamic and sediment behaviour of the channel, transport and the strategies that could be adopted to improve navigation whilst minimising environmental impacts.

However, it is important that readers understand the conclusions gained from this study are subject to the limitations of available data and the limitations of the numerical model in predicting sediment transport, erosion and accretion patterns. Based on our understanding of the physical processes in the channel, the complexity of the problems being encountered and the ability of the model to predict sediment transport and geomorphological behaviour, we believe that our assessment provides a good indication of the potential benefits (and impacts) of a range of possible future management strategies for Swansea Channel.

The benefits considered are essentially related to navigation, and the need for on-going maintenance dredging in the future. As outlined previously, no attempt has been made at assessing the potential benefits to the wider community and local businesses resulting from improved accessibility through Swansea Channel following dredging. Recommendations are thus provided from on a more technical perspective.

9.2 Long Term Options

Based on the limited long term options analysed in this report, it appears that the most cost effective solutions involve dredging the main channel (northwards past Marks Point) to a depth of around –4.0 m AHD with a width of around 120 m. In reality, it is expected that the optimal solution for dredging would involve a depth of between –3.5 m AHD and –4.0 m AHD and a width of somewhere between 60 and 120 m. More refined numerical modelling would be required to find the optimum dredging configuration that maximises benefits, whilst minimising the amount of material to be removed. This additional modelling would be carried out during detailed design stage of any future works.

The main area of concern for options that include dredging of a –4.0 m AHD deep and 120 m wide channel would appear to be related to the potential erosion adjacent to the north-eastern foreshore of Elizabeth Island. This could likely be minimised by adjusting the orientation of the main dredge channel. Different channel alignments could also be analysed during the design phase of the works.

Modelling indicated that the dredged channel appears to be susceptible to possible infilling in the vicinity of the southern entrance to Swan Bay for options where an opening to Swan Bay is retained. In this area, the channel ‘feels’ the effect of the open entrance which takes some of the flow from the main channel, resulting in slower current velocities and deposition of sediment.

The stability of the dredged channel in the vicinity of the southern entrance to Swan Bay can be improved by the partial or full closure of the southern entrance to Swan Bay. Full closure would

most likely result in poorer tidal flushing within Swan Bay, although it would significantly minimise the potential for wind wave erosion currently experienced on the eastern foreshore of Swan Bay. By adjusting the width of the opening, it is expected that a balance between channel stability and water quality within Swan Bay could be achieved.

The weighted benefit/cost assessment (Section 8.3.3) suggests that for the "full closure" option the negative impacts associated with reduced tidal flushing would be outweighed by the improvements to channel stability and the reduced need for future maintenance. As a results, the option to dredge the channel in combination with refilling the southern entrance proved to be the 'best' option, when considering all factors.

As indicated in Section 8.1.1, the long term dredging options have been considered on the assumption that safe navigation into and out of Swan Bay will be provided via the northern entrance. Approximately 46,000m^3 of sand still needs to be removed from the northern sections of Swan Bay in accordance with the former dredging EIS (Resources Planning, 1988). The costs of finishing the proposed dredging in Swan Bay have not been included in the cost estimates for the channel dredging options, as it is considered to be part of a different works program, which may attract different funding sources, and be carried out within a different timeframe.

9.3 Short Term Options

The large capital expenditure that would be required to achieve the long term objectives (approximately 3.8 million dollars for the preferred option) suggests that a realistic 'short term' option should also be recommended. It is noted that the practice of recent times, which has involved minimal dredging of the dog-leg prior to the main boating season, has typically had short-lived benefits, prompting considerable community concern.

The main issue which can be addressed in the short term is that of navigation in the immediate vicinity of the Swan Bay southern entrance . Figure 9-1 shows a suggested location for relatively 'small scale' dredging in order to re-establish a straight navigation channel between Pelican Marina and Marks Point. If dredged to a depth of –3 m AHD, which is consistent with current depth towards the northern end of the existing navigation channel, the short term works would involve removal of approximately 80,000 m^3 of sand. Modelling of this short term option was also carried out. Sediment erosion accretion patterns (refer to Figure G13, Appendix G) indicate that the subject area would require regular dredging to maintain navigation. Preliminary calculations estimate that maintenance dredging may be required as often as every year, while ever the large sand shoal remains within the main northern navigation channel.

It is considered that wherever possible, implementation of the short term option should be aligned with the long term option. For this reason, WBM suggests that the material removed form the channel for the short term option is placed within the deeper sections of the southern entrance to Swan Bay, and the deep holes that are relic from over-dredging by past commercial operations (refer Figure 9-2). Any amount of material that can be returned to the southern entrance will result in a reduction in the works required to 'fill the gap', when implementing the preferred long term option.

Modelling with and without filling of deeper sections of the southern entrance to Swan Bay indicates that the deposited material would remain relatively stable, providing that a navigable passage is maintained in the channel. Obviously, hydrographic monitoring of the channel following

implementation of the short term option would be essential in determining the need for maintenance dredging in the future.

Also requiring consideration will be the need to maintain navigation through the channel during the period of the short term dredging. In this regard it may be necessary to temporarily stockpile the dredged material before placing it within the current navigation path.

Short term options should also consider addressing the immediate foreshore erosion problem at Naru Point. At present, high velocities associated with flows into and out of the southern entrance of Swan Bay are impinging on the Naru Point foreshore. In order to realign these high velocities away from the foreshore, a small stub groyne could be constructed in a northerly direction (refer to Figure 9-1). The groyne would also trap sand that has been remobilised from further inside the Bay. The stub groyne can be the start of a larger groyne that will span most (if not all) of the southern entrance, as a long term management option (refer Section 9.2).

Indicative cost associated with dredging approximately 80,000 m^3 of sand from the main navigation channel and disposing of it within the nearby deep dredge holes would be in the order of $500,000. Costs for construction of a small (20 m long) stub groyne off Naru Point would be approximately $100,000.

Figure 9-1 Swansea Channel Management Short Term Option

Figure 9-2 Area of Reclamation