EXECUTIVE SUMMARY

The River Hamble Harbour Authority (RHHA) commissioned research to investigate spatial and temporal change, possible causal factors and opportunities for management or restoration of saltmarsh in the lower River Hamble (below the A27 road bridge) on the UK south coast. Following a review of literature which places saltmarsh decline and related factors into global and regional context, the research was approached through a series of pre-determined questions designed to address concerns and opportunities related to the marshes.

The questions related to the extent of saltmarsh decline to date and in the future. Factors potentially relating to the decline or growth were considered with specific attention to any role river dredging may have. Dredged sediment types and potential suitability for beneficial re-use in saltmarsh restoration schemes were identified, as well as which of the river's saltmarshes may be suitable. In addition, consideration of impacts and benefits, other sediment management approaches and the possible costs of such schemes and potential funding sources were considered.

Geographical Information System analysis of aerial imagery and aerial LiDAR data (obtained from the Channel Coastal Observatory and the Environment Agency) identified the significant decline in the lower River Hamble (below the A27 road bridge) saltmarsh features since the available 1870 baseline data to the last available (2014) data set. The majority of decline is strongly associated with the major marina building period of the 1960s and 1970s. Since that time, marsh areas have continued to decline, though less markedly, and to some extent fluctuated in area with some localised accretion in some of the locations.

On an individual basis, the major factor identified as potentially impacting the river's marshes is sea level rise and coastal squeeze and related waterlogging due to human infrastructure at the river edge on either bank, preventing the natural migration of the marshes landwards. Other factors affecting the marshes include *Spartina* die-back and loss of sediment binding, localised dredging effects and potentially vessel (wave) impacts, and algal smothering; often related to excess nutrients associated with human habitation and river use. The algal factor, in conjunction with erosion, is cited in saltmarsh condition assessments undertaken by Natural England, in which marshes in the river are largely assessed as unfavourable recovering.

Globally researchers have shown that dredge drawdown and slumping of fine sediment through spoil removal does occur. However, specific consideration of dredging as a major factor in marsh decline in the River Hamble provides ambiguous conclusions, although dredging and sediment supply alteration during the marina building period will have exacerbated marsh loss. In addition to ambiguity, the inherent variance in the available data sets for spatial analysis also inhibits definitive conclusions. Localised small scale drawdown effects are apparent and in some locations offer a potential for management to highlight local beneficial effects. In the future, close scale terrestrial LiDAR with minimal data error is recommended to enable accurate monitoring of spatial and temporal marsh change.

Whilst data were not available for all locations, assessment of sediment suitability for use in beneficial placement schemes to promote marsh regrowth in the Hamble indicates that the dredge arisings will be suitable in physical quality. Sediments also need to be assessed for contaminant levels and whilst Hamble sediments have contamination, none of the available data showed levels above Action Level 2, which would require disposal in landfill. There may, however, be residual pockets of contamination thus

replicated testing would be required. Organic material needs to be at sufficient levels in sediment to promote biological interaction by colonising species, thus this will also require assessment should sediment placement options be pursued.

Detailed consideration of the Hamble marshes through multi criteria analysis did not indicate one site in particular as a suitable location for a major beneficial use location, though a minor scheme is suggested. There are considerable constraints on such schemes in the Hamble associated with potential infrastructure impacts and the effects of such placement on highly protected natural habitats and species, potentially necessitating detailed assessment. In addition, some locations are not declining and deliberate placement of sediment may adversely affect marshes which are relatively healthy.

In comparison with beneficial use schemes, sediment management through retention methods may offer localised scale opportunities to enhance some River Hamble saltmarshes. The likelihood of success cannot be guaranteed, not least as marshes are complex ecological systems which are not fully understood in terms of reason for decline, or change due to human impact. However, retention schemes have met with some success (as have large scale beneficial use schemes where appropriate) and offer an opportunity for several locations to be used as trial or small scale project sites. The ecosystem service benefits of marshes are now more understood, such as passive coastal protection and ecological enhancement, therefore efforts to improve marsh habitat, where feasible, should be considered. This should be undertaken with due caution to ensure no adverse effects on these features and nearby human infrastructure. Early stakeholder engagement is advised with suitable monitoring schemes developed.

The project also called for a brief assessment of possible funding sources with indicative costs. Whilst costs are problematic to predict, not least as commercial consultants will have different pricing regimes, an outline has been supplied where reasonable estimates are available. Possible funding sources have been indicated, but it should be noted that the level of funding required will depend on schemes considered with some of the smaller options offering potential for useful outcome with relatively limited input. In comparison, one scheme, (the Hamble Marsh option) will require greater funding but may offer significant benefit if successful.

Accordingly, several smaller scale retention schemes, plus the Hamble Common Marsh beneficial use option, have been suggested. Whilst small in scale, if taken up, cumulatively they may offset marsh losses and have a positive effect on saltmarsh area in the Hamble Estuary. These are:

- Satchell Marsh – management options to promote marsh regrowth through artificial channel control and drainage development;
- Little Marsh – drainage development and retention structures to promote lower marsh growth at “cliffing” edge;
- Hamble Common Marsh – sediment retention structures plus localised beneficial use of dredge arisings and management of localised dredging effect.

In due course, dependent on finance and development of options, larger schemes may be feasible at:

- Bunny Meadows – change in culvert system to slow erosive flows plus sediment retention and larger scale beneficial use in Bunny Meadows north or south;
- Swanwick Marsh – possible larger scale sediment retention structures project with appropriate monitoring. Recent small scale *Spartina* growth suggests this site may be marginal towards promoting plant growth on retained sediment.