# Using Sediment As a Resource (USAR): Brightlingsea Harbour Dredging and Restoration Project

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**Introduction:** Brightlingsea Harbour, UK, is subject to the natural deposition of sediment. In addition, due to changes in the use of the local waterways and the increasing size and capacity of commercial vessels, this sediment is now causing significant concern to Brightlingsea Harbour Commissioners (BHC), the managing authority of this historic Cinque Port (~1000AD). In order to maintain the safe and efficient use of the navigational waters, the removal of approximately 53,000m$^3$ of accumulated sediments is required.

As part of the Interreg 2 Seas initiative, "Using Sediment As a Resource (USAR)", this sediment will be dredged over 4 consecutive winters (Oct. – Mar., 2016-2020), with the majority of the arising material to be beneficially used to restore local, protected intertidal mudflat and saltmarsh, with associated benefits for ecosystem services (incl. NFM).

Saltmarsh has been shown to result in a reduction of energy, equivalent to an approximate 20% decrease in wave height during storm surge conditions [1]. The natural attenuation of wave energy also provides associated cost savings for man-made coastal flood defences, with an 80m wide strip of saltmarsh saving an estimated £400 per linear metre of a 3m high crest seawall [2]. Due to the ability of saltmarsh to 'grow' vertically through sediment accretion, they also offer resilience in the face of predicted sea level rise [3].

**Methods:** Baseline environmental monitoring allowed the detailed physical and chemical characterisation of the site. The data was also utilised to develop a 2D hydrological and geomorphological predictive model, using this information, a detailed dredging plan was formulated in 2015.

Through the comparison of historical aerial photographs from 1946 and 1953 with current satellite imagery, areas of saltmarsh habitat loss and continued degradation were identified.

Restoration sites were selected based on the dredging plan, environmental conditions and areas identified as suffering historic losses of saltmarsh. The process was undertaken in collaboration with local stakeholders and relevant regulatory bodies.

The restoration sites required natural brushwood fences and drop board sluices to retain newly placed dredged material, whilst sediments remain susceptible to erosive forces during dewatering, consolidation and subsequent biological colonisation. During the works, environmental monitoring has been undertaken to ensure the works do not cause significant adverse impacts to the environment and to allow an adaptive management approach [4].

**Results:** The project is now at the half way stage and to date, has removed approximately 25,000m$^3$ of accumulated sediments from the main approach channel, an area adjacent to a commercial wharf and from within navigation channels that provide access to recreational moorings. A cutter suction dredger and a vessel mounted long-reach excavator with both backhoe and clam-shell heads have been employed to undertake the dredging works.

Following the installation of the required retaining structures, arising dredged material has been mechanically placed and hydraulically pumped into restoration sites, restoring approximately 3.16ha of protected intertidal habitats.

**Discussion:**

The beneficial use of dredged material (BUDM) for the creation, restoration or enhancement of intertidal and coastal habitats provides benefits for biodiversity and improves ecosystem health, with additional benefits associated with the provision of ecosystem services such as natural flood management [5].

To support regulatory bodies and similar BUDM applications in the future, Exo Environmental is conducting long-term research in collaboration with the University of East Anglia and the University of Essex. This will provide a quantitative assessment of BUDM impacts on ecosystem health and functioning, thereby supporting evidence-based decisions for the future application of beneficial use projects.

**References:** [1] Möller et al. (2014) *Nature Geoscience* **7**:727-731; [2] Toft et al. (1995) *National Rivers Authority* **324**:123; [3] Haslett et al. (2001) *Estuarine, Coastal and Shelf Science* **52**:143-153, [4] PIANC (2017) *Working with Nature*, [5] CEDA (2018) *Beneficial Use: Position Paper*.