**Key Issues**

Removal of 19,000m$^3$ of sediment in a designated site of European and national importance in terms of ecology, i.e. The Broadland SPA and Ramsar site, The Broads SAC; and Trinity Broads SSSI.

Several nationally rare aquatic plants are also present in Trinity Broads; the Starry Stonewort being a new discovery in 2016.

Ecological sensitivities are different throughout the year, with the summer months deemed to be more sensitive, restricting the mud pumping activity to the winter months (although wintering birds are of international importance during this period).

Intensive recreational use during the summer months.

Due to the rights afforded to ESW, the works did not need planning permission or require an EIA despite Trinity Broads being an ‘environmentally sensitive area’. However, due to this sensitivity the requirements of Natural England (NE) had to be complied with, as part of an Assent, and in particular, all potential impacts to the water environment had to be minimised.

A waste exemption was also required from the Environment Agency (EA) for the deposition of the extracted mud on to adjacent farm land, and all their requirements and concerns met.

**Purpose of the project**

The removal of accumulated sediment from the Trinity Broads, Norfolk, to comply with a regulatory requirement imposed by the EA and NE, that would allow the continued abstraction of water from Ormesby Broad and the River Bure by Ormesby Water Treatment Works (WTW), to provide water to Great Yarmouth, particularly during periods of peak demand. The Trinity Broads comprise of five interconnected shallow lowland lakes including Ormesby, Ormesby Little, Rollesby, Lily and Filby Broads.

**Description of the project**

- Removal of approximately 19,000m$^3$ of sediment outside of a 3m non-intervention margin.
- Mud pumping activity in 8 locations, during the winter months only.
- Hydraulic pumping using barge-mounted pumps with inlet suction pipes and pipes from the barge to geobags on land.
- Disposed to five adjacent Sediment Recovery Areas, via the filling of geobags.
- Subsequent land spreading in the autumn, following natural dewatering.
Lessons learnt

Early and regular liaison with stakeholders was essential. Both the EA and NE understood the need for the project and were in favour of it, but both had water environment associated requirements that needed to be meet to allow the project to go ahead. Close liaison also took place with the Broads Authority who had undertaken similar mud pumping activities in the recent past, and lessons learned and knowledge gained from these works were taken forward into The Trinity Broads project.

Services provided by MWH included the development of the Detailed Proposal for Mud Pumping (including the methodologies for mud pumping and sediment disposal), the undertaking of a Wintering Bird Study (using existing WeBS data), the updating of the Habitats Regulations Assessment previously prepared by ESW, the undertaking of a Water Framework Directive Compliance Assessment, the preparation of a technical memoranda on the Holly-leaved Naiad (aquatic plant), and the obtaining of the NE Assent and EA Exemption. These activities all took place in parallel with the tendering process for the mud pumping and sediment disposal activities. As such, close working with tendering contractors (who were specialist and experienced), and the finally appointed contractors, was essential in order that the preferred and alternative methodologies were appropriately considered and that the most suitable mitigation measures were identified to minimise the potential impacts to the water environment.

In addition to the engineers, the MWH team included hydrologists, hydrogeologists, land contamination specialists, ecologists, environmental planners, and environmental permit specialists. All had to work closely as a team, providing their expert inputs in a timely manner to ensure that all deliverables were provided as required.

Many of the services provided involved the collation, analysis and interpretation of technical or specialised information. For example, the preparation of the technical memoranda on the Holly-leaved Naiad helped the team understand the requirements of this rare aquatic plant, enabling the proposed works, including mitigation measures, to be designed with the best possible outcome. The Wintering Birds Study had to select appropriate information (in terms of species, timeframe, and location) from nearly 20 years’ worth of data for the whole of Trinity Broads, in order to quickly determine the most appropriate sequencing for the 8 location proposed for mud pumping activities over the winter months.

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Lessons learnt cont.

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