

Rye Meads STW – Lagoon Remediation engineering solution minimises environmental impact

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Rye Meads STW was built in the 1960s to serve the new towns of Stevenage in Hertfordshire and Harlow in Essex and currently treats a population equivalent of 400,000. The works consists of standard primary sedimentation, activated sludge and secondary sedimentation processes. The effluent is passed through eight tertiary lagoons (comprising two trains of four lagoons each) prior to discharge to the Toll House stream which, within a short distance, joins the River Stort. Over a period of years, residual solids built up within the lagoons and these need to be removed in order to maintain effluent quality.



Dredger showing floating discharge pipeline & guide cable (courtesy Thames Water Utilities Ltd)

Environmental considerations

The eight lagoons cover an area of approximately 11 hectares and are part of a Site of Special Scientific Interest (SSSI). They are also a component of the Lee Valley Special Protection Area (SPA) and are thus covered by the EU Habitat Directive. The area surrounding the lagoons has a wide range of wetland habitats. The reed beds, open waters and meadows attract many different birds and the lagoons themselves are an important habitat for migratory birds (including Gadwall and Shoveller) during winter, as well as being a valuable breeding site for wetland birds.

As such, all actions including routine maintenance are subject to prior approval from English Nature who act as the regulatory body on behalf of the government. The RSPB, Lee Valley Park and Middlesex Wildlife Trust and Rye Mead Ringing Group are also involved on site.

Task & constraints

Approximately 0.8 tonnes of suspended solids from the Final Settlement Tanks are deposited in the lagoons each day, which results in a build up of solids, especially in the first two units of each train. Over time, silt depth increases to approximately 70% of the lagoon depth. Without action this would create a higher level of fine solids in the works final effluent than is desirable, reduce effluent quality and eventually this could lead to consent failure. Infrequently, therefore, it is necessary to remove accumulated solids from the lagoons. It was ten years since the lagoons had last been dredged and an estimated 57,000m³ of solids had accumulated, which needed to be removed.

This project started in August 2001 and consultation between Thames Water Conservation and Heritage Team and English Nature quickly highlighted disturbance to over wintering birds as



Dredger adjacent to cage used by Bird Ringing Group (courtesy Thames Water Utilities Ltd)

a potentially significant issue, along with disturbance to other bird life in the following breeding season. It was assessed that work on the lagoons would not be detrimental to bird life up to late December, but the potential then existed that all work would have needed to be suspended until Autumn 2002, unless a suitably environmentally friendly approach was adopted that did not disturb habitats.

Solution

The contract for remediation of the lagoons was awarded to one of Thames Water's existing *Process Alliances*, comprising *Thames Water Engineering, Laing Utilities and Hyder Consulting*. A project strategy was developed that involved dredging the first train of four lagoons in the most environmentally friendly way possible by the end of December 2002. This would then be reviewed with the aim of demonstrating to and agreeing with English Nature that minimal disturbance of the habitat occurred during this stage of project execution, such that work that followed straight on to the second train of four lagoons.

Preserving the habitat

During work in the lagoons, it would still be necessary that a significant portion of the works flow be passed through them. Although this flow would be minimised in the train being dredged, flow and water level in the lagoon needed to be maintained to preserve the habitat for the bird life. In addition, if inappropriate methods were used there would be a risk that solids would be disturbed and pass through to the effluent being discharged to the stream with risk of an effluent consent failure. This risk would be highest with the two lagoons immediately adjacent to the works outfall.

As well as the problems associated with the lagoon habitat, initial investigations had demonstrated that, using typical dredging equipment, the volume of solids/water mixture that would be dredged from the lagoons could be increased by as much as ten fold by the dredging process from the solids volume of 57,000m³ that needed to be removed. This volume of material would have been extremely difficult to deal with and the project team sought a solution that would produce both significantly less volume from the lagoons and also maximise the dry solids content of the final product.

Following further investigation a sub-contract was awarded to *Dirk European Holdings* who were able to supply both a specialist dredging unit (sourced from Germany), which would minimise solids disturbance, together with a centrifuge installation to dewater the dredged material.

Silent dredging

The electrically powered and silent dredging unit extracted settled material of approximately 4% dry solids from the lagoon bed at a rate of up to 150m³/hr with minimal disturbance. This sludge was then pumped, using two electric booster pumps, via an overland 1.5km long temporary pipeline to a temporary buffer storage facility. This allowed a reduced constant feed to the centrifuge installation. The sludge was thickened to 6%-8% dry solids using two centrifuges each capable of thickening up to 50m³/hr before being pumped to a storage lagoon for ultimate disposal. The centrate from the centrifuges was returned to the head of the works for treatment.

Both the strategy and the execution of the works proved to be very successful. In order to be able to demonstrate to English Nature that the dredging operation would have minimal effect on the bird life, the help of the RSPB was sought. They were able to conduct a detailed bird survey (covering both numbers and species) before the work commenced on site, with ongoing monitoring whilst dredging took place. There was no measurable impact on the bird population, even in the lagoon being dredged. This was attributed to the complete silence of the barge (the generator was sited some distance from the lagoons) and the 'eco friendly' green covering to the barge, which acted as weather protection to the operators and also hid them from sight.

The first train of four lagoons was completed on schedule before Christmas 2001 and English Nature, who had visited the site during the works, gave permission for work on the second train to commence at the beginning of January 2002. The project was successfully completed ahead of schedule in March 2002. Total cost of the works was approximately £1m which was within the original budget. ■

Note. The author of this article, Keith Mansell, is Senior Project Manager, Thames Water Utilities.