White Horse Reservoir

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White Horse Reservoir Clay Compaction Trial

Summary of Findings

April 2026

View of the clay compaction trial taking place at the proposed new reservoir site in Oxfordshire

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Introduction

As part of our planning application process for the proposed White Horse Reservoir, we are carrying out a range of surveys and investigations to build a thorough understanding of the geology in the local area, which will help inform our reservoir designs. As part of our ground investigations, in Spring 2025 we carried out a clay compaction trial on fields near Steventon, building three test embankments.

The trial involved testing how Kimmeridge Clay and Gault Clay from the site performed when compacted, which is informing the designs for the watertight embankments around the reservoir.

During the trial, we dug the clay out of the ground and compacted it to test its strength and water content and to understand how it performs under pressure. We used land within the proposed reservoir site to best represent likely ground conditions for the wider reservoir footprint, along with access to nearby the Hanney Road. An aerial view of the trial is shown in Figure 1 below.

Figure 1: *Aerial view of clay compaction trial*

Why did you carry out a clay compaction trial?

The primary purpose of the clay compaction trial was to confirm how suitable the soils and Kimmeridge Clay is for reservoir construction.

The construction of three trial embankments enabled us to test how the Kimmeridge Clay performed when compacted (or squeezed) to confirm the required placement methodology, while also recovering samples for laboratory testing to inform the design process.

The data we gathered is being reflected in the designs for the reservoir, namely the safe watertight embankments. The research will also supplement wider ground investigations being undertaken across the site and support our planning application to government. A full-scale embankment trial will be built and tested post planning consent as part of the early phase of construction works.

What ground conditions were recorded?

To deliver the clay needed to build the trial embankments, we dug a 'borrow pit' which was excavated next to the site, 14 metres below ground level (see Figure 2 below). This provided us with detailed information on the structure and composition of the Kimmeridge Clay, which is predominantly proposed for use in the core and shoulders of the reservoir embankment. The Kimmeridge Clay would also be used to support the construction of other elements, such as new roads and rail facilities across the site, reducing the amount of material we need to import.

The ground conditions were recorded as the excavation progressed. Two layers of cementstone were encountered during the excavation, ranging in size from cobbles to boulders up to approximately 1 metre in diameter. Layers of fossils were also recorded in the excavation and evidence of bedding and fissuring was evident throughout.

The geological structure of the clay was examined. The clay was found to be stronger than anticipated from the small diameter boreholes carried out previously.

Figure 2: *Excavation within borrow pit*

Testing and sampling

'Clay samples' were obtained for geotechnical laboratory testing to provide additional key design information. These supplemented the existing data and confirmed the visual observations that the clay is stronger in-situ than previously anticipated.

Building three trial embankments

Three panel embankments were constructed during the clay compaction trial to determine how easily the clay could be formed into the shoulder and core of the reservoir embankment. The material was compacted in layers of varying thickness and tested following varying levels of compaction. Preliminary results suggested that whilst the higher-than-expected strength was positive from a foundation perspective, the material would require water conditioning to create the core.

A second phase of trial panels were completed, which involved the addition of water and mechanical conditioning, which provided valuable information about the quantity of water that would need to be added to form the core material. The trial also provided reassurance that the Kimmeridge Clay under the site is suitable to form the remainder of the embankment.

Figure 3: *Compaction of Kimmeridge Clay trial panel*

Summary

The clay compaction trial was successful, confirming that the Kimmeridge Clay can be excavated and placed to form the reservoir embankments, and provided additional information for the design as it progresses. It allowed careful inspection of the clay in a large excavation, which has furthered our understanding of how it will behave.

Next steps

Building on the findings from the trial we will be carrying out further ground investigations and testing, including digging pits to see and sample the clay at various locations around the site. The investigations will feed into refining the reservoir construction methodology, including earthworks techniques and the design of the full trial embankment.

Glossary

Reservoir embankment

Reservoir embankments are large, engineered earth structures built to hold back water and form a reservoir. They act as the barrier between stored water and the surrounding land, safely retaining millions (sometimes billions) of litres of water.

Embankment core

A type of embankment that uses a central core of clay that acts as a seal to stop water from leaking through the structure.

Embankment shoulders

Reservoir embankment shoulders are the outer supporting parts of a reservoir embankment, built on either side of the watertight core.

Geological structure

A geological structure is the way rock or soil layers are shaped, broken, or folded beneath the ground as a result of natural forces over time.

Bedding

Bedding refers to the layered structure of the clay, formed when clay is deposited over time.

Fissuring

Fissuring refers to cracks or fractures in the clay that develop after deposition.

Clay compaction

This is the process of mechanically compressing clay soil to make it denser, stronger, and much less permeable. It is a key step in the earthworks construction of the reservoir embankments.

Geotechnical laboratory testing

Geotechnical laboratory testing is the testing of soil and rock samples in a laboratory to measure their engineering properties; testing for strength, how much water they hold, and how they compress or deform under load.

Further information

For further information, please visit our website thames-sro.co.uk/whitehorsereservoir or email the White Horse Reservoir team: whitehorsereservoir@thameswater.co.uk