

In the UK, a combination of regulatory oversight, inspections, maintenance programmes and emergency readiness measures ensure that reservoirs are managed and operated safely

The legal framework for reservoir safety in England

Construction, operation, maintenance and modification of large reservoirs in England and Wales must be carried out in compliance with the Reservoirs Act 1975 (the Act) as amended by the Water Act 2003 and Schedule 4 (Reservoirs) of the Flood and Water Management Act 2010.

The Act, along with its associated secondary legislation and guidance, is reviewed and refined by the UK government to ensure it remains fit for purpose. The proposed South East Strategic Reservoir Option (SESRO) would be sufficiently large for the Act to apply.

The Act provides the legal framework for ensuring reservoir safety and does the following:

- Requires the design, construction and initial operation of new reservoirs to be undertaken under the supervision of a competent engineer who is already appointed to a panel of such engineers by the UK government.
- Requires ongoing surveillance and operational data collection for existing reservoirs, along with the continuous appointment of a competent engineer to oversee their performance in relation to reservoir safety.

- Requires periodical independent inspection of reservoirs by a competent engineer who can recommend further investigation be done or modifications made to maintain reservoir safety.
- Empowers enforcement authorities (in England, the Environment Agency) to enforce compliance with their standards and which enables them to impose penalties on reservoir owners who fail to meet their legal obligations.

The Act is supplemented by several regulations which provide further detail on reservoir safety. There is also supplementary guidance for managing specific technical aspects of reservoir design and operation, such as managing floods, seismic risk and drawdown capacity. General guidance to reservoir owners (and operators) on how to comply with these legislative requirements can be found on the government website: www.gov.uk/guidance/reservoirs-owner-and-operator-requirements



Designing the reservoir

Design supervision

The Act requires the design and construction of new reservoirs to be supervised by an appointed 'Construction Engineer'. To hold this appointment, the engineer must be highly experienced and have already been appointed to an appropriate panel of reservoir engineers. In the case of SESRO, which would be a 'non-impounding' reservoir (i.e. one not blocking a natural flow of water with a dam or embankment), the engineer must have been appointed either to the "All Reservoir" Panel or the "Non-impounding" Panel. Appointments to these panels are made by the Secretary of State (of the Department of Environment, Food and Rural Affairs) following applications vetted by the Reservoirs Committee - a committee of the Institution of Civil Engineers which assists the Secretary of State in this duty. The threshold of competence for such panel appointments is very high. At the time of writing there are just 30 All Reservoir Panel Engineers in the UK.

A Construction Engineer has been appointed for SESRO to oversee the design work for the preparation and submission of the application for Development Consent, as well as subsequent design development, trials and then construction.

For large new reservoir and dam projects, international best practice promotes the establishment of a board or panel of specialists to review design and construction work. This is also reflected in current UK Guidance under the Act, and provides further supervision to that of the Construction Engineer. Such a 'Reservoir Advisory Panel' (or "RAP") has been set up for SESRO and is currently active.



Safety features in the design of the new reservoir

Design work for SESRO follows international best practice for embankment dams, to ensure the highest possible standard of dam safety is met. Some of the key design features would include:

- **A wide and robust embankment design**, and controlled vehicular access to the crest, limiting the risk of accidental or deliberate damage.
- **Wave erosion protection**, with the entire inner face of the embankment protected against erosion from extreme storm winds.
- **Emergency drawdown capacity of 1 metre per day (m/day)**. Large UK reservoirs typically have permanent systems that can lower water levels if there are any signs of structural distress. The SESRO design allows the reservoir to be drawn down at a rate of 1 m/day from its maximum operating level, which is the maximum rate recommended in current UK guidance.
- **Monitoring and surveillance**, using a comprehensive automated instrument system built into the dam as part of a wider monitoring strategy to detect unexpected movement or leakage. Any alerts would trigger an appropriate response under Thames Water's established reservoir safety management system, already in use at its other sites. These readings would complement on-site checks by staff trained in reservoir safety surveillance.
- **Measures to prevent overfilling**. As with many Thames Water reservoirs that are filled by pumping from nearby rivers, SESRO would include a full control system to avoid the water level exceeding safe limits.

Most reservoirs in the UK are impounded by a dam across a watercourse, so rain falling within the natural catchment upstream of the reservoir is directed through it. Such reservoirs need to handle large inflows during extreme storm events. In the case of SESRO, the reservoir would be fully bunded (in other words fully contained), and the only inflows during extreme storms would be rain falling onto the reservoir surface.

Emergency preparedness and dam break analysis

Reservoir owners (and operators) must have emergency response plans in place to deal with any potential incidents including those which could lead to a breach of the reservoir dam.

The likelihood of a breach at SESRO is extremely low. This is because the reservoir would be fully contained, it would include the design features described earlier, and its design, construction and operation would all be closely supervised.

A reservoir dam break analysis looks at what could happen if the dam were to fail and how nearby areas might be affected. It uses specialist software to simulate how water would flow in the event of a breach.

The models take into account factors such as the volume of water in the reservoir, the dam's characteristics and the surrounding landscape, in order to assess the extent of any flooding.

The outcomes of this modelling are then used to shape emergency planning.

An emergency response plan would be in place before the reservoir is filled for the first time, in line with the requirements of the Reservoirs Act 1975.

You can find out more about our proposals for the new reservoir (SESRO) by visiting our website at thames-sro.co.uk/SESRO



