Dams and reservoirs

Innovative solutions to reservoir safety challenges
HR Wallingford has the specialist knowledge to help solve the most complex dams and reservoirs related challenges. With over 60 years experience in hydraulic engineering, our internationally renowned experts use the latest developments from our cutting-edge research to deliver innovative, sustainable and cost effective solutions.

Our unique mix of research and consultancy skills are supported by state-of-the-art numerical modelling tools and large physical modelling laboratories. We collaborate on some of the most nationally significant dams and reservoirs projects.

**Reservoir risk assessments**

Our staff have a wide range of experience in the design and application of differing types of risk assessments for reservoirs, and have driven the development of the latest national guidance on reservoir risk assessment for the UK Government.

- Bespoke portfolio risk assessment for reservoirs using a variety of methodologies
- Qualitative risk assessment for reservoirs
- Quantitative risk assessment (QRA) for reservoirs using the UK Interim Guide to QRA methodology
- Advice on the new UK Risk Assessment for Reservoir Safety (RARS) methodology
- Confident application of the new RARS methodology
- Integration of reservoir risk assessments with real-time monitoring data or with dambreak and inundation modelling

**Reservoir sedimentation and flushing**

With nearly 30 years research and consultancy experience in reservoir sedimentation, we can help prolong reservoir asset life.

- Appropriate dam drawoff and scour outlet design
- Commission, supervision and interpretation of reservoir bathymetric surveys
- Reservoir sedimentation studies, modelling and predictions
- Design and incorporation of reservoir flushing operations within the owners O&M regime
- Sedimentation field monitoring advice and staff training
- Development of reservoir sediment management strategies
- Canal and hydropower intake desander design
- Evolution of reservoir storage capacity curves
Dambreak assessment and flood mapping

Although usually low probability events, dam breaks or embankment breaches can have enormous cost and loss of life consequences. Responsible dam owners seek to assess and manage this significant risk (probability and consequence) in order to protect those downstream and to manage their liability.

> Scenario assessment, potential risk identification
> Use of simplified (AREBA) or more complex (HR BREACH zoned) software to predict breach growth through embankment structures
> Use of INFOWORKS-RS or other software to simulate dam/reservoir failure
> Flood routing and mapping of varying complexity (1D, integrated 1D-2D, 2D)
> Associated risk assessments and emergency planning
> Loss of life modelling using life safety models
> Development of emergency management plans

Physical and numerical modelling for dams and reservoirs

Our state-of-the-art physical modelling facilities are used to optimise structure designs at an early stage, preventing costly operational issues later. Our complementary numerical modelling systems ensure a solution for any complex hydraulic design problem.

> Physical modelling of flow patterns, scour erosion, and wave impact for dams, spillways, gates, channels, bridge piers and more
> Use of the INFOWORKS hydraulic modelling suite of software to model 1D or 2D flow
> Use of the RESSASS software to model sedimentation processes
> Use of HR BREACH (original and zoned) and AREBA software to model embankment breach development
> Use of GIS software to model dam-related flooding downstream
UK reservoir Panel Engineer services

HR Wallingford can provide the following specialist services relating to the UK Reservoirs Act 1975:

> Supervising Panel Engineer services
> Inspecting (All Reservoirs) Panel Engineer services*
> 24 hour reservoir safety emergency advice and response
> Qualified Civil Engineer (QCE) services*
> Reservoir safety advice
> UK reservoir legislation advice
> Non-statutory dam safety inspections and reporting

*Depending on circumstances, this may be through a trusted sub-consultant

Dam monitoring and early warning systems

Our recent advances allow us to offer reservoir owners exciting new opportunities for cost-effective monitoring of embankment dams. Services include design and specification of bespoke long-term monitoring systems embedded in embankment dams.

> Specification and installation of embankment sensors
> Continuous real-time monitoring of sensor data streams
> Application of engineering judgement and Artificial Intelligence (AI) computer programmes to identify data anomalies, possible causes and dam behaviour (including potential failure mechanisms)
> Provision of a bespoke suite of modelling software for visualisation of breach consequences
> Cost effective solutions when compared to current one-off temperature or resistivity surveys
Specialist expertise in

- Reservoir sedimentation and yield assessment
- Dam safety inspections (including Panel Engineer services under the UK Reservoirs Act 1975)
- Reservoir and river hydrology - including climate change effects
- Development of emergency flood plans (on-site and off-site)
- Numerical and physical modelling of hydraulic structures
- Engineering design of hydraulic structures
- Dambreak assessments, loss of life and inundation modelling
- Cost effective bathymetric surveys
- All types of reservoir risk assessment
- Real-time embankment dam monitoring and early warning systems
HR Wallingford is an independent engineering and environmental hydraulics organisation. We deliver practical solutions to the complex water-related challenges faced by our international clients. A dynamic research programme underpins all that we do and keeps us at the leading edge. Our unique mix of know-how, assets and facilities includes state of the art physical modelling laboratories, a full range of numerical modelling tools and, above all, enthusiastic people with world-renowned skills and expertise.