

# Dam Safety

Geosyntec is highly experienced in the use of both standards-based deterministic and risk-based probabilistic evaluations of earthen dams and levees, concrete dams, spillways, outlet works, and other ancillary structures using best-practice modeling and analytical methodologies.

## Dam Safety Compliance

- Dam safety inspections
- FERC Part 12D inspections and Comprehensive Assessments
- Design and as-built document reviews
- Regulatory compliance reviews
- Dam safety surveillance monitoring plans and reports (DSSMP/DSSMR)

## Geotechnical

- Geotechnical, geologic, and geophysical investigations
- Seepage and internal erosion analyses and control
- Static and dynamic stability and liquefaction analyses
- Instrumentation and monitoring

## Structural

- Stability assessments and condition evaluations
- Material testing and field investigations
- Structural finite-element analyses
- Hydraulic structure design

## Seismic Evaluations

- Deterministic and probabilistic seismic hazard analyses
- Evaluation of earthquake ground motions
- Site response analyses

## Hydrologic and Hydraulic Analyses

- Watershed hydrology, PMF, and flood hazard loading analysis
- Spillway design flood and spillway capacity evaluations
- Hydraulic, hydrodynamic, and CFD modeling of spillways, channels, and outlet works
- Dam break analyses and inundation mapping

## Risk Assessment and Risk-Informed Decision Making

- Facilitation of PFMA workshops
- Quantitative risk assessments (QRA) and semi-quantitative risk assessments (SQRA)
- Consequence and hazard potential evaluations, emergency action planning and exercises
- Development and implementation of risk reduction measures (filters/drains, seepage barriers, stability berms, etc.)

## Engineering, Design, and Permitting

- Rehabilitation alternatives evaluations
- Preparation of design packages and bidding assistance
- Environmental and permitting services

## Construction Phase Services

- Construction Quality Control (CQC) and Construction Quality Assurance (CQA) Programs
- Engineering support during construction
- Instrumentation data acquisition and interpretation
- Information Management Systems for project planning, data tracking, and analysis
- Data visualization and reporting using dashboards, geospatial tools, and automated drawings



## SAMPLE PROJECT EXPERIENCE

### Boone Dam

In response to a sinkhole discovered near the downstream toe of the earthen embankment and subsequent muddy, turbid discharge in the tailrace just downstream of a hydrogeneration unit draft tube outlet, TVA implemented interim risk reduction measures to protect against progressive failure of the dam. Geosyntec was retained to execute the project Instrumentation Monitoring Plan during completion of a deep grout curtain and concrete cutoff wall. Geosyntec monitored the performance of the dam both through visual dam safety inspections and through real-time monitoring of dam safety instrumentation as well as the contractor's instrumentation system during construction. Geosyntec was responsible for the comprehensive evaluation of the data being collected in order to assess the performance of the dam through all phases of construction and changes in reservoir levels.

### Southeast Appalachia Dam

Geosyntec evaluated a semi-hydraulic fill dam built between 1925 and 1930 and located in the southeast Appalachia region. The dam is a puddled core embankment dam founded upon low-grade metamorphic rock. As the prime consultant, Geosyntec evaluated the safety of the dam by performing seismic deformation analyses, internal erosion and slope stability analyses, spillway modeling and breach evaluations, as well as a Quantitative Risk Assessment (QRA) on the entire facility. Currently, Geosyntec is responsible for a dam safety modification study to address risk-driving failure modes identified for the dam and spillway. The interdisciplinary design efforts include

development of remediation alternatives with feasibility-level designs and an alternatives evaluation for the dam owner to make risk-informed decisions to select the preferred design alternative.

### Oroville Dam

Geosyntec's Lelio Mejia was the co-Independent Consultant and Geosyntec staff were an integral part of the team pioneering the process for incorporating FERC Level 2 Risk Assessment results in a Part 12D Safety Report. The Tenth Part 12D Safety Inspection Report for the Oroville Complex was the first for any hydroelectric project in the United States to incorporate results from a FERC Level 2 Risk Assessment. The Complex, owned and operated by the California Department of Water Resources, consists of three dams (Oroville, Bidwell Bar Canyon Saddle, and Parish Camp Saddle) that create the Oroville Reservoir. Geosyntec's Joe Goldstein also served as one of the Consequences Subject Matter Experts reviewing downstream consequence modeling results and providing potential life loss estimates.

### Utility Agencies-Owned Dams

Geosyntec has conducted FERC Part 12D Safety Inspections for multiple dams owned by power and water utility agencies. Our work included document review, field inspection, facilitating PFMA workshops, preparation of FERC Part 12D Safety Inspection reports, and updating PFMA and STI reports. For a large power utility, Geosyntec conducted inspections for eight dams (seven classified as High Hazard) in their inventory with heights ranging from 22 feet to 315 feet. For a water utility, Geosyntec managed the

last three Part 12D Safety Inspections of a 240 ft high, 1400 ft long zoned earth-rock embankment dam currently undergoing an extensive seismic retrofit design. Geosyntec implemented significant updates to the STIs for several dams owned by another power utility. Geosyntec served as a subject matter expert on geotechnical engineering during the SQRA and QRA and related PFMA of a concrete-faced rockfill dam subject to potential overtopping under the newly promulgated FERC Risk-Informed Decision Making Guidelines.

### Sites Reservoir Alternatives Analysis and Feasibility-Level Design

Geosyntec is the project lead for the configuration and design of two regulating reservoirs - Funks Reservoir, an existing reservoir which will be modified, and the new Terminal Regulating Reservoir. The regulating reservoirs allow for concurrent operational management of canals and of pumping and power-generating plants that control flows in and out of Sites Reservoir. The goal for Sites Reservoir is to create additional 1.5 million acre-foot off-stream storage for drier periods. Geosyntec performed feasibility development, evaluation, and design for the reservoirs, including coordinating with stakeholders, identifying objectives, and developing design criteria; conceptualizing, creating, evaluating, and selecting layouts and configuration alternatives; conducting feasibility-level analysis and design for the reservoirs and appurtenant features; and preparing design documentation, quality review documentation, and quantities and cost estimates.

### About Us

Geosyntec is a consulting and engineering firm that works with private and public sector clients to address new ventures and complex problems involving our environment, natural resources, and civil infrastructure. With a combined staff exceeding 2,200 engineers, scientists, and related technical and project support personnel, we serve our clients from more than 100 offices in the United States, Canada, the United Kingdom, Ireland, Sweden, Finland, Spain, the United Arab Emirates, and Australia.

### For More Information

[dams@geosyntec.com](mailto:dams@geosyntec.com)

**Geosyntec**  
consultants