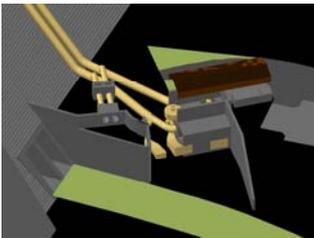


Seismic Safety of Dams with Active Faults

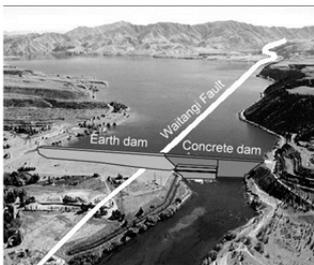
Mokihinui



Feasibility Study of Dam Adjacent to Active Fault (2007-2008)

An 80 to 85 m high RCC dam and 65-85 MW hydro electric power station is proposed for the Mokihinui River on the West Coast of the South Island New Zealand. The site is in an area of high seismicity, steep topography and slope stability hazards, while the Mokihinui River is prone to large rapidly-rising floods. A major (potentially active) fault is within 1km of the dam site. Key areas of the project were targeted to identify site conditions and look for geological features that would require remedial works, or in the extreme, be potential fatal flaws for the project. Faults and reservoir slopes were also assessed to determine project risks and determine potential earthquake shaking loads. Design analysis adopted earthquake loads up to 0.91g peak ground acceleration. Damwatch presented key elements of the project to resource consent (licensing) hearings before independent commissioners and stakeholders.

Aviemore



Seismic Load and Active Fault Evaluation for Waitaki River Dams (1999-2007)

Meridian Energy own and operate a chain of 8 power stations on the Waitaki River in the South Island. The Waitaki River valley is traversed and crossed by a number of active faults. In the upper reaches of the river, the power stations, canals and dams are in the vicinity of the major plate boundary fault, the Alpine Fault. Between 1999 and 2007 the fault activity and seismicity of the area was investigated and assessed. Of particular note was an investigation that demonstrated that the Waitangi Fault in the foundation of the Aviemore Dam was active. Detailed investigations and assessments showed that the dam would safely withstand a movement event on the fault. The Aviemore Dam studies are considered to be leading edge of dam safety practice.

Murray Gillon was a principal technical advisor to Meridian Energy and assisted in the study scoping, management and review through its several stages.

Waikato River Chain



Seismic Load and Active Fault Evaluation for Waikato River Dams (1999-2005)

Mighty River Power own and operate a chain of 8 power stations on the Waikato River. The river traverses the Taupo Volcanic Zone, an area of active faulting and volcanism. Between 1999 and 2005 the fault activity and seismicity of the area was investigated and assessed. Of particular note was an investigation that demonstrated that active faults terminated each side of the Ohakuri Power Station but were not active through the site.

Murray Gillon was a principal technical advisor to Mighty River Power and assisted in the study scoping, management and review through its several stages





Seismic Safety of Dams with Active Faults

Matahina Dam



Matahina Dam Strengthening for Active Fault Displacement (1995-1998)

The Matahina Dam is an 86m high rockfill dam located in the Eastern Bay of Plenty in the North Island. In 1987 it was damaged by 0.33g shaking from a magnitude 6.3 earthquake. The dam was repaired and returned to service. Investigation of faults crossing the dam foundation showed that they were active. Studies demonstrated that the dam would not withstand the typical fault movements of 3m lateral displacement. The lake was lowered pending strengthening works. The subsequent strengthening of the dam for upto 3m of fault displacement was thought to be a world first. The strengthening comprised the building of a free draining rockfill buttress with a wide filter zone and the raising of the crest to increase freeboard.

Murray Gillon was the owner's principal dam engineer and managed and led the investigations and design of the strengthening works.

Development of Seismic Design Criteria

Development of Seismic Design Criteria

As part of seismic load evaluation studies on the Waikato and Waitaki River power stations, Meridian Energy and Mighty River Power co-operated in the development of seismic safety criteria for their dam structures. The criteria were developed by studying international guidelines and standards together with New Zealand requirements. Once established the criteria were widely publicised internationally to test their acceptability. They have been widely used since.

Murray Gillon developed the methodology and the project brief and managed and participated in the development of the criteria.

Edgar Fault Dam Safety Study



Edgar Fault and Dam Safety Studies in Tasmania (2004-2005)

Scientific studies of the Edgar Fault in Tasmania showed that the fault had moved several times in the last 70,000 years. The fault traverses Lake Peddar which is formed by three dams, including one dam that is adjacent to the fault. Damwatch advised on fault investigation studies and provided an assessment of the likely performance of the three dams in the event of an Edgar Fault rupture event. Damwatch also commissioned state of the art studies of the potential for future activity on the Edgar Fault. These studies advanced the state of knowledge of fault activity in a stable continental environment.

Murray Gillon led the studies and John Black and Nigel Connel evaluated the likely performance of the dams.

Clyde Dam Joint



Clyde Dam Seismic Joint (1990)

The Clyde Dam is a m high concrete gravity dam on the Clutha River. During design studies it was shown that movement could occur on the river channel fault in the dam foundation. A special joint was designed to accommodate up to 2m of movement. This was a world first. John Black was responsible for the design of the seismic joint.

