

Mitman, Jeffrey

From: Mitman, Jeffrey *mm*
Sent: Tuesday, April 06, 2010 1:05 PM
To: Ferrante, Fernando
Subject: RE: Historical dam failure rate analysis paper

Not yet.

From: Ferrante, Fernando *mm*
Sent: Monday, April 05, 2010 9:09 AM
To: Mitman, Jeffrey
Subject: RE: Historical dam failure rate analysis paper

Jeff,

Did we respond to this e-mail? I already forgot if we did or not.

Thanks,
Fernando

From: Mitman, Jeffrey
Sent: Thursday, March 25, 2010 1:22 PM
To: Ferrante, Fernando; Pohida, Marie
Subject: FW: Historical dam failure rate analysis paper

I received this email this morning. I've not yet replied to Neil, and I would appreciate it if you do not either until I've formulated my response.

In any case, Neil is misusing information and/or does not understand the statistical analysis. His conclusions about a dam failure rate of $7E-5$ is wrong! His statement about $2E-5$ for Jocassee is his unsubstantiated opinion.

I'll write a more lucid analysis later.

Jeff

From: Coleman, Neil *NC*
Sent: Thursday, March 25, 2010 12:04 PM
To: Mitman, Jeffrey
Cc: Wescott, Rex; Wilson, George; Khanna, Meena
Subject: RE: Historical dam failure rate analysis paper

Jeff,

Thanks for sending this paper. I've looked at the analysis by Baecher et al. (1980) and updated the calculation they did on page 454 (upper left) through 2009. Let me know if you disagree with their method of approximation. My numbers yield 15 failures (increased from their 12) out of 6190 dams (increased from their 3200), with an average operational period of $69/2 = 34.5$ (updated from their $32/2 = 16$).

The annual failure rate per dam year (dams higher than 15 m) from Baecher et al. (1980) (i.e., $2E-4$) is updated to $7E-5$. Please note that the population mainly consists (~85%) of homogeneous earthen dams, and so best represents that class of dam. I suggest that the updated number better represents an upper failure probability for a continuously monitored, well built, zoned rockfill dam like Jocassee. Additional analysis of this problem may be possible to yield a better expected value or range (rather than just an upper failure

probability). Until doing further analysis, my best guess is that an expected value for Jocassee would approach $\sim 2E-5$, or perhaps less. Please note that the updated failure rate ($7E-5$) may continue to fall as the period of record continues to lengthen. Alternatively, it may level off as dams continue to age.

I noticed one interesting conclusion in the paper by Baecher et al. (1980), which you highlighted. The authors state (page 454) that "Decrepitude, inadequate maintenance, and poor operational procedures seem to account for few failures of dams of moderate to large size." The Taum Sauk failure (which post-dates their paper) was caused by human error and poor maintenance (or poor design) of stage monitoring systems, and I would add it should have had an uncontrolled spillway to prevent the failure scenario. Based on my recollection, this is the only recent failure of a large U.S. dam with documented construction quality like that of Jocassee.

Hope this is helpful.

Best regards,

Neil

From: Mitman, Jeffrey

Sent: Tuesday, March 23, 2010 10:00 AM

To: Coleman, Neil; Wescott, Rex

Cc: Khanna, Meena; Wilson, George

Subject: Historical dam failure rate analysis paper

Rex and Neil, attached is a paper from 1980 that gives interesting insights and perspective on dam failures and failure rates. It's written not by PRA types but some civil engineers from MIT. You might find it of interest.

Jeff

PS The highlights are mine.