Presentation Taken From One Developed for Reclamation Best Practices

• This is not meant to fully represent how Reclamation would teach Best Practices for Reservoir Exceedance

• The presentation is to provide an introduction to important concepts that Reclamation has developed over many years
Key Concepts

• Reservoir Elevation key loading parameter for evaluating potential failure mode

• Example: load on radial gate function of square of the water height on gate

• Consequences are function of reservoir elevation; can dramatically increase with small change in elevation

• Probability of attaining a given range in reservoir elevation an important risk analysis consideration
Risk Analysis Applications

Goal:

• Develop Reservoir Elevation Exceedance Probability Curves for Specific Potential Failure Modes

• Static - e.g. seepage/piping
• Seismic
• Flood Related – e.g. overtopping, chute walls…
Reservoir Elevation Data
Reservoir Elevation Data Processing

• QA/QC Very Important

• Daily Data, Monthly Data (end of month), missing data

• Make a time series plot
Reservoir Elevation Data Processing

Example Dam Reservoir Data - 4/12/1955 through 3/12/2006

Look for bad data, sudden shifts, change in operations
Reservoir Elevation Data Processing

• Two types of reservoir exceedance curves

• Annual Maximum – distribution of maximum observations (one per year) for static potential failure modes

• Daily (or seasonal) – distribution of daily observations for seismic and flood potential failure modes

• Rank the data from maximum to minimum

• Use a plotting position (e.g. Weibull) to estimate probability

\[ p(i) = \frac{l}{n + 1} \]
Example Dam Reservoir Data - 1955 through 2005
Annual Reservoir Elevation Exceedance Probability for use with Internal Erosion Risk Analysis

Annual Exceedance Probability vs. Reservoir Elevation (ft)
Example Dam Reservoir Data - 4/12/1955 through 3/12/2006
Percentage of Time Exceedance for Seismic and Hydrologic Risk Analysis

Percent of the time the Reservoir is over a given Elevation

Reservoir Elevation (ft)