Potential Failure Modes Analysis

Hells Canyon Complex

Brownlee, Oxbow & Hells Canyon Dams

Federal Energy Regulatory Commission Workshop

January 27-30, 2004

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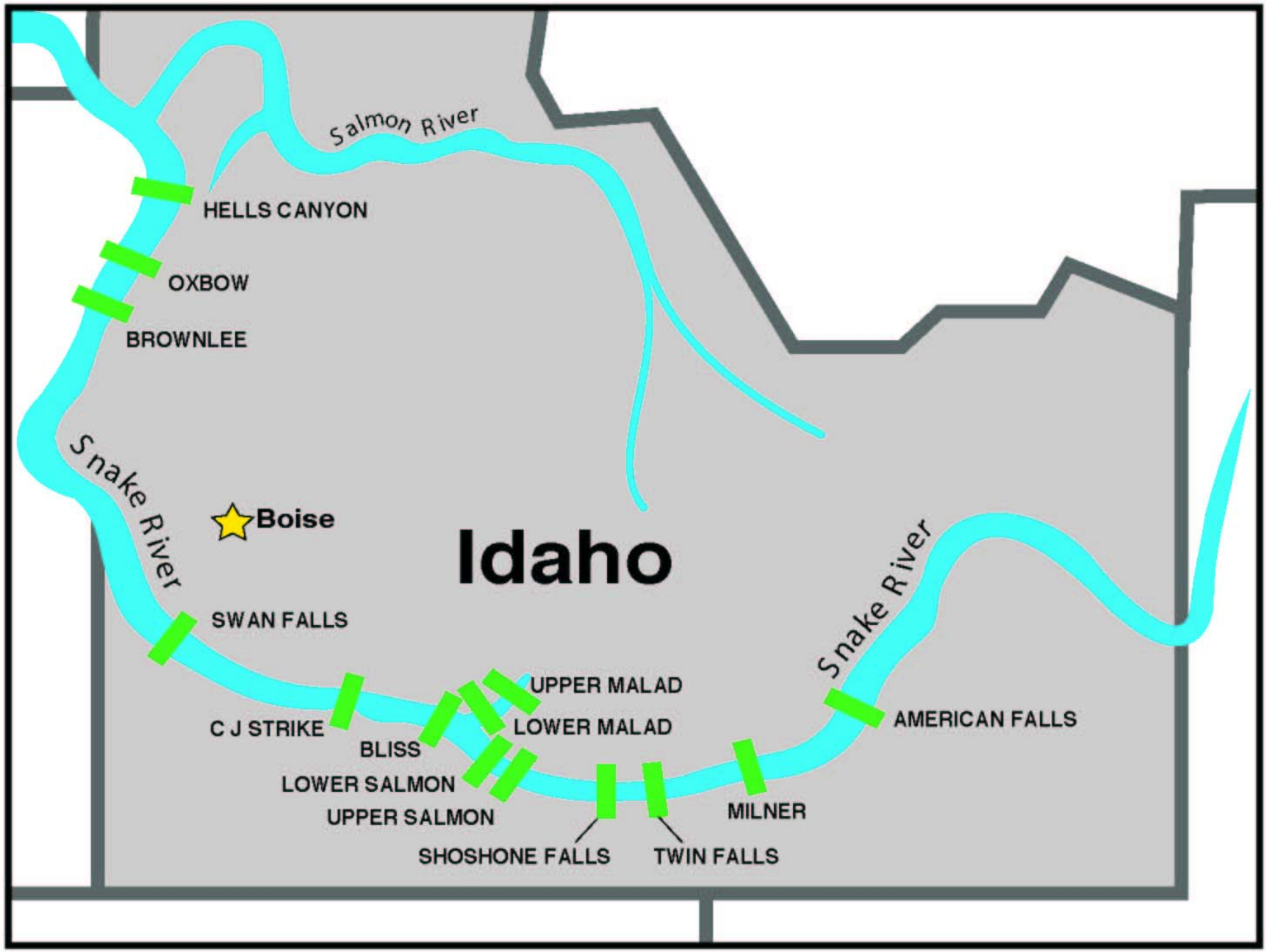
Salmon River
HELLS CANYON
OXBOW
BROWNLEE
Snake River
Boise
Idaho
SWAN FALLS
C J STRIKE
BLISS
LOWER SALMON
UPPER SALMON
SHOSHONE FALLS
UPPER MALAD
LOWER MALAD
TWIN FALLS
MILNER
Snake River
AMERICAN FALLS

Brownlee Dam - 1958

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Oxbow Dam - 1961

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Hells Canyon Dam - 1967

330’ Concrete Gravity Dam

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Part 12 & PFMA Schedule

- January 3, 2003 - Initial letter from the F.E.R.C.
- February 14, 2003 - Issue RFP to consultants.
- March 1, 2003 - Begin working on STI documents.
- April 4, 2003 - Contract awarded to MWH Americas, Inc.
- April 5, 2003 - Determine PFMA core team members.
- May 29, 2003 - Mailed last of three STI's to team members.
- June 9, 10 & 11, 2003 - Conduct PFMA.
- June 12 & 13 - Part 12 & Annual FERC Inspections.
- July 11, 2003 - Send draft PFMA reports to core team for comments.
- September 31, 2003 – Finalize PFMA reports & incorporate into STI's.
- October 24, 2003 – Draft Part 12 reports to Idaho Power.
- November 29, 2003 – Part 12's and STI's submitted to the F.E.R.C.

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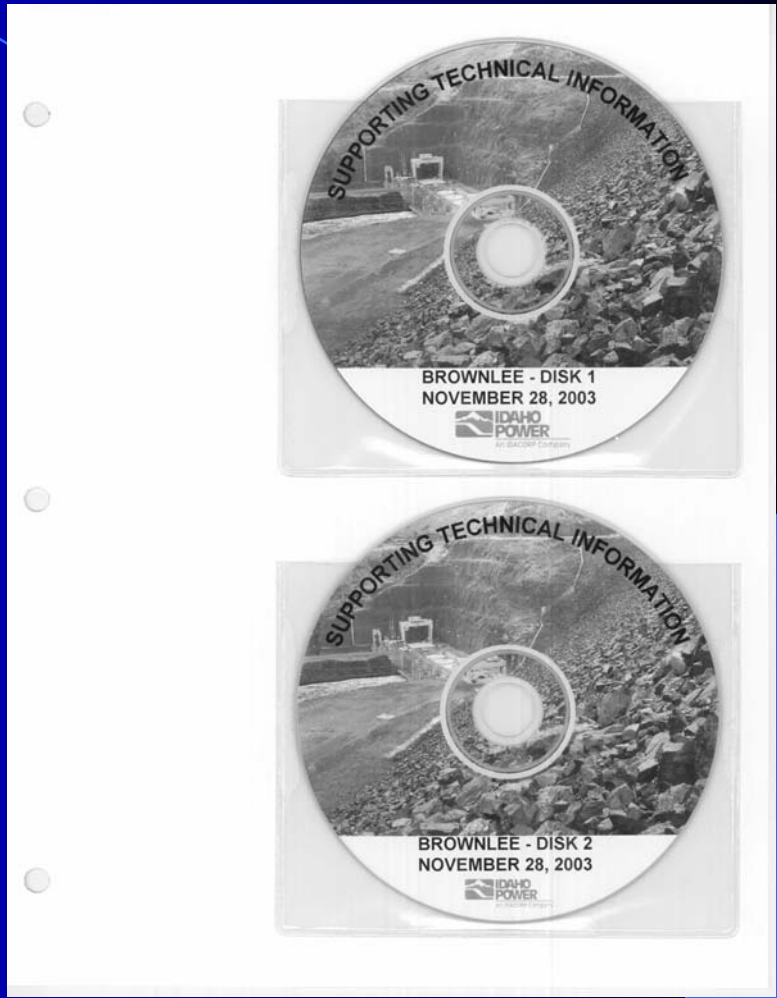
Lessons Learned – STI

- Allow adequate time to prepare.
- STI's are a great reference document if prepared well.
- Putting historical data on CD-ROMs worked well.
- Send to core team in advance of the PFMA.
- Start Early!!!



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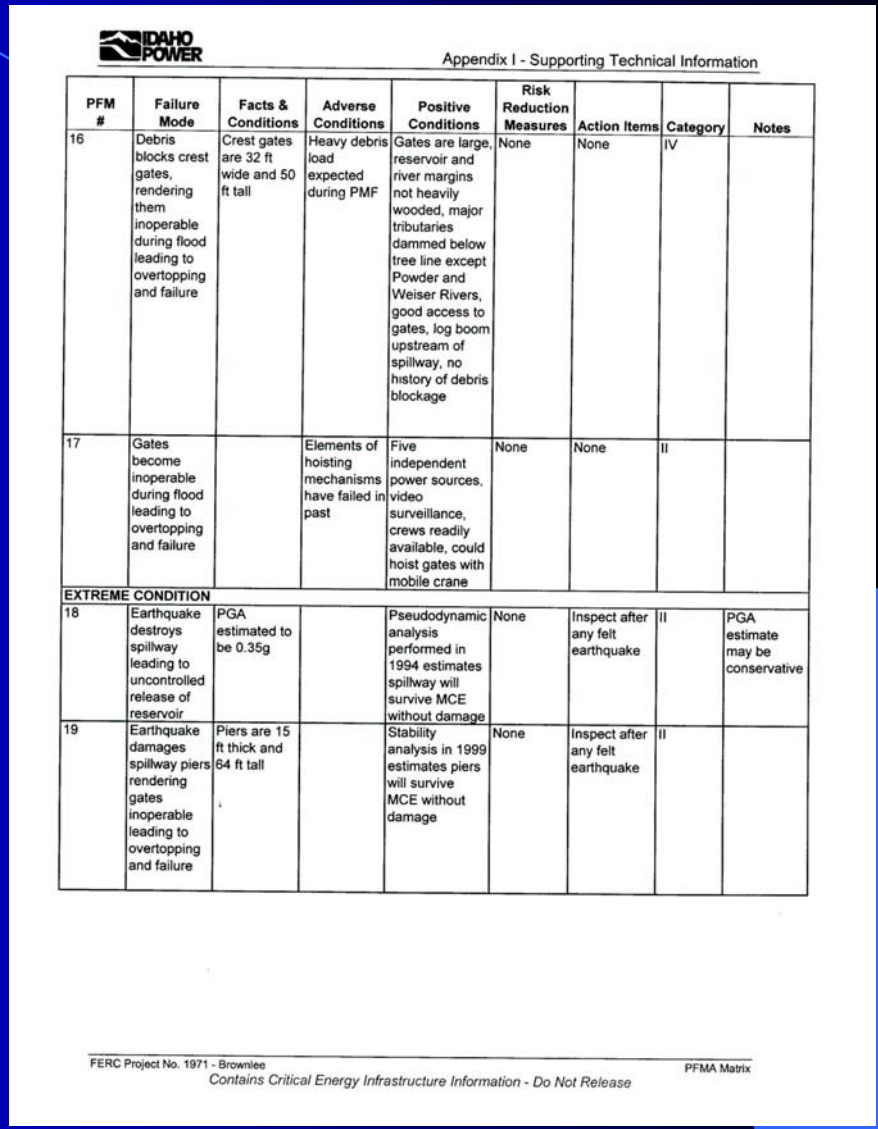
Lessons Learned – PFMA

- Trade Facilitator services with other licensees.
- Conduct PFMA's at or near project site if possible.
- Go over category definitions with the team before starting.
- Laptop and projector worked well for notes and viewing photos, drawings and historical documents (less emphasis on flipcharts).



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Appendix I - Supporting Technical Information

PFM #	Failure Mode	Facts & Conditions	Adverse Conditions	Positive Conditions	Risk Reduction Measures	Action Items	Category	Notes
16	Debris blocks crest gates, rendering them inoperable during flood leading to overtopping and failure	Crest gates are 32 ft wide and 50 ft tall	Heavy debris load expected during PMF	Gates are large, reservoir and river margins not heavily wooded, major tributaries dammed below tree line except Powder and Weiser Rivers, good access to gates, log boom upstream of spillway, no history of debris blockage	None	None	IV	
17	Gates become inoperable during flood leading to overtopping and failure		Elements of hoisting mechanisms have failed in past	Five independent power sources, video surveillance, crews readily available, could hoist gates with mobile crane	None	None	II	
EXTREME CONDITION								
18	Earthquake destroys spillway leading to uncontrolled release of reservoir	PGA estimated to be 0.35g		Pseudodynamic analysis performed in 1994 estimates spillway will survive MCE without damage	None	Inspect after any felt earthquake	II	PGA estimate may be conservative
19	Earthquake damages spillway piers rendering gates inoperable leading to overtopping and failure	Piers are 15 ft thick and 64 ft tall		Stability analysis in 1999 estimates piers will survive MCE without damage	None	Inspect after any felt earthquake	II	

Contains Critical Energy Infrastructure Information - Do Not Release

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PFMA – Room Setup

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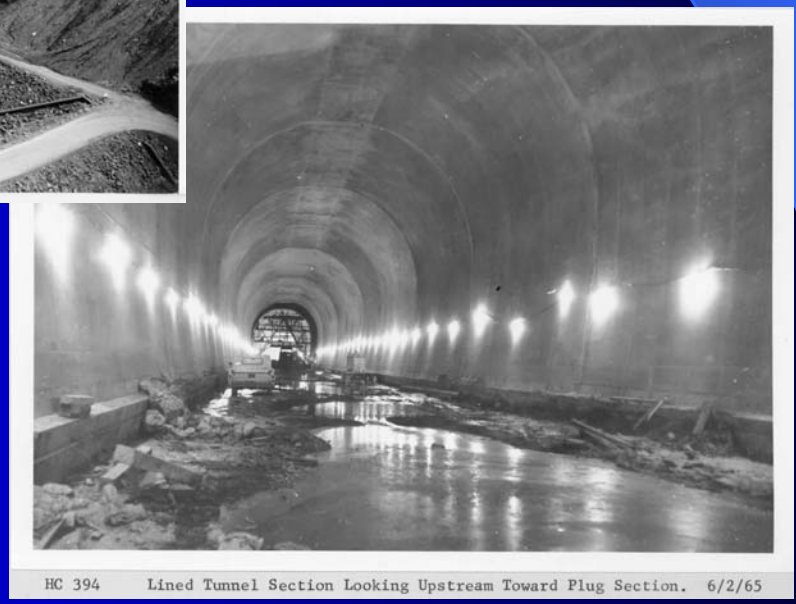
PFMA – Original Construction Photos

Clay core & rock fill areas from Idaho side. Sept.14,57 (1157)



HC 394 Lined Tunnel Section Looking Upstream Toward Plug Section. 6/2/65

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General Lessons Learned

- Expensive the first time through, but should make future Part 12's cheaper.
- Prepare STI's in-house if possible.
- Perform Part 12 & Annual F.E.R.C. inspections while at the project site.
- Part 12 and STI bound together in a 3-ring binder.
- How many PFMA's in a week?

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