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7 June 2003

Mr. Constantine Tjoumas
Director, Division of Dam Safety and Inspections
Federal Energy Regulatory Commission
888 First Street, NE, Room 6N-01
Washington, D.C. 20426

Re: Report No. 1
FERC Independent Review Board
Silver Lake Dam

Dear Mr. Tjoumas:

At your request we have agreed to serve as an Independent Review Board to investigate the breach of Silver Lake Dam on May 14, 2003. The dam is owned by the Upper Peninsula Power Co. and is located on the Dead River about 20 miles west of Marquette, Michigan. A general description of the incident and conditions as of May 23, 2003 is given in Attachment I, and was furnished to the Board by FERC.

During the week of May 26-30 the Board was sent a package by FERC for the Board to review before visiting the site. The list of documents provided in this package is given in Attachment II. The design report for the recently constructed fuse plug was one of the most significant documents in this package. Prior to the site visit a one page listing of key elevations was made as shown in Table I.

The Board members arrived at Marquette, Michigan on the late afternoon of Wednesday, June 4 and were met by Constantine Tjoumas and Jim Evans of the FERC Washington office of Dam Safety.

On the morning of June 5 the Board met at the Ishpeming offices of the Upper Peninsula Power Co. (UPPC) with Mr. Tjoumas and Mr. Evans of FERC and the following power company representatives; Mr. Robert Meyers of UPPC, Mr. Gary Erickison of UPPC, Mr. Gil Snyder of Wisconsin Public Service (WPS), Mr. David Harpole of WPS, and Mr. Barth Wolf of WPS. Mr. Robert Meyers gave the group a powerpoint presentation of the conditions observed and videotaped at Silver Lake Dam during the enlargement of the breach and the observations at Hoist Dam, McClure Dam, Marquette Upper Dam, and Marquette Lower Dam. Marquette Lower Dam also breached at the embankment dam section due to overtopping because the spillway capacity was too small to handle the flows resulting from the Silver Lake Dam breach. After the presentation of the current conditions of the Dams on the Dead River the Board and FERC representatives were taken to the field by Mr. Robert Meyers of UPPC and Mr. Gil Snyder of WPS.

The Board was initially taken to the right side of the fuse plug at Silver Lake Dam. Several hours were spent inspecting both the left and right sides of the newly eroded channel of the Dead River at the location of the breached fuse plug. The Main Dam, the concrete spillway structure, the non overflow concrete low level outlet structure and Dike #1 were also inspected.

The Board then inspected the conditions at both the right embankment dam and the concrete dam comprising Hoist Dam. In the late afternoon the group then inspected the breach at Marquette Lower Dam.

After the field inspections the Board met for discussions at the offices of UPPC at Ishpeming. After several hours of discussion the Board and FERC representatives

presented Mr. Meyers and Mr. Snyder a list of items of information which are considered to be needed as soon as possible in order to proceed with the investigation of the incident. This list was generated by the FERC staff team which inspected the site just prior to our inspection; the Board added several items to this list.

In addition to the list given to the power company as mentioned above, the Board has requested FERC to furnish the following information to the Board.

1) Documentation on what are considered to be the normal operation levels of the reservoir in times before flood events. This includes the level which is considered to be the maximum normal reservoir elevation.

2) Reports on the studies of the PMF and development of any curves of flood inflow versus return period for the Silver Lake watershed.

The Board has had several internal discussions of the possible causes of the Silver Lake breach during Board Meeting No. 1. Our thoughts on this topic are considered to be preliminary at this time and are based on the documents previously furnished and the field inspection. It is our judgment that it is premature to present our thoughts on this matter until the additional information requested has been analyzed.

In the future it will be desirable for the Board to interview separately the designers of the fuse plug, the FERC group in the Chicago Regional Office responsible for reviewing the fuse plug design, the most recent Part 12 Inspector, the author of most recent Inspection Report produced by the FERC Chicago Regional office, and the UPPC staff responsible for operating the reservoir, particularly the low level outlet and stop logs or flash boards on the fourth bay from the left side of the spillway.

On our inspection unweathered glacial tills were observed in the lower portions of the eroded channel at the fuse plug. Weathering of these tills was observed above the unweathered tills and at very shallow depths some alluvium or outwash was observed. It is our opinion that the exposures on the left and right sides of the eroded channel at the fuse plug location should be mapped by a geologist experienced in glacial geology. Some trenching may be necessary. This mapping should be aided by the surveyors currently working in the field so that the mapping can be made accurately in terms of x-y co-ordinates and elevations.

Respectfully submitted,

Alfred J. Hendron Jr.

Nelson Pinto

J. Michael Duncan

Table I

Key Elevations, Silver Lake Dam

(elevations in feet)

Dam crest	1490.7	
Ogee crest	1486.25	
Ogee stoplog invert el.	1480.25	(Fourth bay from left)
Fuse Plug Top Elevation	1486.5	
Pilot Channel Invert Elevation of Fuse Plug	1485.5	(There are two of these channels)
Channel Invert el. at bottom of Fuse Plug	1481.0	
Top of Dam Crest to be regraded to el.	1491.5	
Stop logs in fourth bay of existing concrete spillway will be removed to el.	1482.5	
Flood of Record	3,950 cfs 6/11/39	Res. El. 1490.7?
FERC Operation Report 19 June 2002, Res. El. during inspection; see photo of Dike 2 in photo 10	1485.8	
Low level outlet, 4 ft diameter, Invert elevation	1456.96	

Attachment I

Dam Safety Incident at Silver Lake Dam – Dead River Project No. 10855
May 23, 2003 update

The Silver Lake dam is located on the Dead River approximately 20 miles west of Marquette in the upper peninsula of Michigan. The Silver Lake dam is a 1500 foot long about 30 foot high earth embankment structure separated at the third points by concrete control structures; a 100 foot long 7.7 foot high overflow concrete gravity spillway with ten 9 foot long bays and a 14.8 foot long 34 foot high non-overflow concrete gravity section with a small conduit bottom outlet. There are also 4 remote saddle dikes; 200, 370, 170, and 290 feet long, ranging in height from 5 to 7 feet. The fuse plug was constructed in one of the saddle dikes; The fuse plug is designed to prevent large flood events from overtopping and failing the main project dam. The project is owned and operated by the licensee, Upper Peninsula Power Co. (UPPCO (part of Wisconsin Public Service).

On May 14, 2003 the licensee advised FERC staff that the fuse plug (a supplementary spillway located about 1/4 of a mile from Silver Lake dam) had activated. The fuse plug activation had been preceded by a heavy rainfall event over the weekend of May 10-11, 2003 including between 4.5 to 5 inches of rainfall falling in a 5-6 hour period over a wide spread area (including the basin) and strong winds from the northeast. This led to a series of events over the course of the last week. In brief, water from the fuse plug activation was mostly contained by the next downstream Hoist dam (storage capacity at maximum pool of 41,700 acre-feet). The discharges passed down through the McClure and Marquette Upper dams. Flows continued downstream and by Thursday, May 15, 2003 they exceeded the spillway capacity of the Marquette Lower dam, the last of the series of dams before reaching Lake Superior. This dam breached through failure of the abutment area. The Marquette Upper and Lower dams are owned and operated by the city of Marquette, Michigan. The Marquette Lower dam has a low downstream hazard potential. The Hoist and McClure dams are owned and operated by the Upper Peninsula Power Co.

As of late May 22, 2003, conditions at the projects (from upstream to downstream) are as follows.

At **Silver Lake Dam** contracted security guards are on site from dawn to dusk, 7 days a week to limit access by the public. STS Consultants, Ltd. has been hired to begin the site investigation and survey work.

At **Hoist Dam** the reservoir level has dropped to 1345.32 feet NGVD (9:45 AM 5/22/03), still slightly above normal with 0.32 feet of water passing over the uncontrolled spillway crest. The toe drain in the earth embankment near the right abutment area where flows had risen with last weeks events continues to flow at 500 gpm (7:45 AM 5/22/03). Units 2 and 3 are operating at full load.

At **McClure Dam** the reservoir level has dropped to 1197.35 feet NGVD (9:45 AM 5/22/03), still slightly above normal with 0.95 feet of water passing over the uncontrolled spillway crest. Units 1 and 2 are operating.

At **Marquette Upper Dam** (as noted above, owned and operated by the City of Marquette, MI) flows are close to normal with 1/4 foot of water passing over the spillway. Two units are on line operating at full load.

At **Marquette Lower Dam** (also City of Marquette) the licensee has had his contractor on site to begin assessing the damage and to start clean up efforts. So far a road has been constructed across the spillway channel for access, some excavation of sand from around the penstocks has been done and the door is back on the plant. The substation is gone although all the parts have been found with the exception of one transformer. Fencing and signs have been posted to prevent access to the site by the public and a local police officer is stationed on site 24/7.

In general with regards to the electrical generation status in the vicinity of the above plants, public conservation efforts are still in place. Additional diesel generator sets at Warden Station are anticipated to be on line by Tuesday, May 27, 2003. A test fire of the Warden Steam Station is anticipated for Tuesday, May 27, 2003. As of the date of this report, the 650 MW Presque Isle generating facility is not expected to be available for four to six weeks.

The Michigan Governor's Protection Order and declared State of Emergency continue in effect.

Wisconsin Public Service Corp. is in the process of surveying reservoir and river banks throughout the basin for areas of bank cutting and erosion that may have occurred due to the high flows. All necessary measures to flatten and/or stabilize banks to ensure the safety to the public are being taken on a timely basis as the issue demands and in coordination with FERC staff.

As of Tuesday May 20, 2003 all projects are being operating under a High (Orange) alert status due to a change in the national threat level by the Office of Homeland Security.

On June 2nd a team of OEP staff will travel to review the incident and meet with UPPCO staff to begin an evaluation of the event. Michigan DNR, Michigan DEQ (state dam safety staff), and Marquette County Emergency Operation Center staff will join and participate with the FERC staff ro review and evaluate the incident. In addition, OEP is retaining the services of engineering consultants with expertise in geotechnical and hydrologic and hydraulic engineering to form an independent board of review.

Attachment II
List of Documents Received from FERC
on Friday, May 30, 2003.

Date	Author	Title
Nov. 29, 2002	Strat, T. G.	"FERC Final Construction Report For the Period June 19, 2002 to October 8, 2002. Fuse Plug Spillway for Silver Lake, Marquette Co., Michigan,"
August 30, 2003	Strat, T. G.	"FERC Operation Report for the Period Sept. 13, 2001 to June 19, 2002 for Silver Lake Development, Marquette Co., Michigan."
August 29, 2002	Strat, T. G.	"FERC Operation Report for the Period Sept. 13, 2001 to June 19, 2002 for the Hoist Development", Marquette Co., Michigan.
August 29, 2002	Strat, T. G.	"FERC Operation Report, Fourth period Sept. 12, 2001 to June 18, 2002 for the McClure Development, Marquette Co., Michigan."
September 12, 2002	Strat, T. G.	"FERC Operation Report for the Period Sept. 12, 2001 to June 18, 2002 for the Marquette Development - Upper Dam and Plant 2, Marquette Co. Michigan."
September 12, 2002	Strat, T. G.	"FERC Operation Report for the Period Sept. 12, 2001 to June 18, 2002 for the Marquette Development - Lower Dam, Marquette Co. Michigan."
April 6, 2001	Harpole, D. W.	Letter to P. Harding, Re: Dead River Hydros Silver Lake grass lined channel velocity.
May 2001	Harza Engineering Company	"Silver Lake Basin Project Design Report Emergency Fuse Plug Spillway and Channel Design" with some of Appendix A. Complete document?

Date	Author	Title
June 6, 2001	Harpole, D. W.	Silver Lake Fuse Plug, Revised Schedule.
June 28, 2001	P. Harding	FERC Letter to D. W. Harpole, WPSC, Review comments on Design Report, Emergency Fuse Plug Spillway and Channel Design for Silver Lake Development, includes Attachment 1 and 2.
August 30, 2001	P. Harding	FERC to D. W. Harpole, WPSC, Review Comments to WPSC submittal for Quality Control and Inspection Program. P-10855 NATDAM No. MI00197
January 15, 2002	P. Harding	FERC letter to D. W. Harpole, Comments to proposed revised schedule for the design and construction of remedial measures needed at the Dead River Project (Silver Lake, Hoist and McClure developments) and Au Train Project.
February 14, 2002	D. W. Harpole	WPSC letter to P. Harding, FERC, Re: Monthly Status Report Due 15th of the Month on Obtaining Needed Permits.
March 14, 2002	D. W. Harpole	WPSC letter to P. Harding, FERC, Re: Monthly Status Report Due 15th of the Month on Obtaining Needed Permits.
March 2002	MWH	Silver Lake Damn Fuse Plug Spillway and Dam Modifications, Design Report, Appendix A, NA, Appendix B, complete?
March 20, 2002	MWH	Silver Lake Dam Fuse Plug and Dam Modifications Project, Quality Control and Inspection Program, Appendix J-4, QCIP Personnel Resumes, J-5, example reports, J-6, Material Testing Schedule and reference documents, JH-7, Construction Schedule, J-8, Record Keeping Procedures.

Date	Author	Title
April 12, 2002	D. W. Harpole	WPSC letter to P. Harding, FERC, Re: Monthly Status Report Due 15th of the Month on Obtaining Needed Permits
May 14, 2002	D. W. Harpole	WSPC letter to P. Harding, FERC, Re: Monthly Status Report Due 15th of the Month on Obtaining Needed Permits.
June 14, 2002	D. W. Harpole	WSPC letter to P. Harding, FERC, Re: Monthly Status Report Due 15th of the Month on Obtaining Needed Permits.
July 15, 2002	D. W. Harpole	WSPC letter to P. Harding, FERC, Re: Monthly Status Report Due 15th of the Month on Obtaining Needed Permits.
September 18, 2002	Craig Harris, MWH	Fax to M. Davis (CRO) and B. Trotter (UPPCO) Re: Recommend that the "rock trench" be eliminated and request FERC concurrence.
September 18, 2002	Craig Harris, MWH	E-mail to M. Davis (CRO) and B. Trotter (UPPCO) Re: 5 Photos of upstream area of the Fuse Plug channel, and Fuse Plug Foundation.
September 26, 2002	P. Harding	Letter response to D. W. Harpole about e-mail from Craig Harris dated September 18, 2002 requesting FERC concurrence that "rock trench" be eliminated.
November 5, 2002	P. Harding	Letter to D. W. Harpole, WPSC, Fuse Plug Spillway at Silver Lake and Au Train Projects. (Missing page 2 of 3)
December 2002	WPSC	2002 Final Construction Report, Silver Lake Basin Project, FERC Project No. 10855.

Date	Author	Title
May 2003	FERC	CD ROM with the following information 2002 CRO Inspection Reports 11/29/02; Strat, Final Construction Report, Period June 19, 2002 to October 8, 2002 Silver Lake Fuse Plug 08/30/02; Strat, Operation Report, Period Sept. 13, 2001 to June 19, 2002, Silver Lake 8/29/02; Strat, Operation Report, Period Sept. 13, 2001 to June 19, 2002, Hoist Development 8/29/02; Strat, Operation Report, Period Sept. 12, 2001 to June 18, 2002, McClure Development 09/12/02; Strat, Operation Report, Period Sept. 12, 2001 to June 18, 2002, Marquette Development - Upper Dam and Plant 2. 09/12/02; Strat, Operation Report, Period Sept. 12, 2001 to June 18, 2002, Marquette Development - Lower Dam. "Additional Air Photos" Folder containing 24 JPEG Images "Construction Inspection Photos, 10/08/02" Folder; 46 JPEG Images "Construction Inspection Photos, 09/05/02" Folder; 85 JPEG Images "J. H. Evans 5-16-03 Photos" Folder; 36 JPEG Images "Spicer 5-15-03 Photos" Folder; 62 JPEG Images "UPPCO 5-15-03 Photos" Folder; 71 JPEG Images

Date	Author	Title
	Information on 5/30/05 CD ROM cont'd	
June 28, 2001	Harding to Harpole	Letter review comments to Design Report, Emergency Fuse Plug Spillway and Channel Design for Silver Lake Development by Harza Engineering Company
May 22, 2003	Brent Nault ?	Dead River Flood May 14- May 16, 2003 Microsoft Powerpoint Presentation
May 1999	Stone & Webster Michigan, Inc.	"Periodic Safety Inspection Report No. 2, Hoist Hydroelectric Development, Dead River Project FERC Project No. 10855 for Upper Peninsula Power Company, Houghton, Michigan