Placer County Water Agency

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October 8, 2004

Mr. Takeshi Yamashita, Regional Engineer
FEDERAL ENERGY REGULATORY COMMISSION
901 Market Street, Suite 350
San Francisco, CA 94103

Re: FERC Project No. 2079-CA; NATDAM No. CA00856
Ralston Afterbay Dam, State of California No. 1030-4, Placer County

Dear Mr. Yamashita:

Enclosed is a copy of the PG&E report, dated September 20, 2004, on the Ralston Afterbay Dam gate opening incident that occurred on August 5, 2004. We believe this is an excellent report that will help us in implementing better procedures and hardware improvements. We are in the process of reviewing the fifteen recommendations that PG&E makes in this report. Testing of the engine-generator, transfer switch, float controllers and gate control circuits is planned for next week and we hope to implement Recommendations 1, 4 and 14 during the testing. Several other recommendations that PG&E has made are immediately compelling and we agree that plans should be made to implement them, specifically Recommendations 3, 7, 8, 11 – 15. We would like to complete the testing that is planned and further evaluation concerning the remaining recommendations.

If you have any questions, please call me at (530) 885-6917.

Sincerely,

PLACER COUNTY WATER AGENCY

Stephen J. Jones
Power System Manager

Enclosure

cc: David Breninger
Edward Tiedemann
Kevin Goishi, PG&E
David A. Gutierrez

OCT 12 2004

September 20, 2004

Placer County Water Agency

Ralston Afterbay Spillgate Incident Investigation

Description of Incident – At 0557 on August 5, 2004, spillgates 1 and 4 at Ralston Afterbay inadvertently opened and released approximately 1,000 AF of water into the Middle Fork American River during tests of the black start feature at Placer County Water Agency's (PCWA) Oxbow Powerhouse located at the base of the dam. The open spillgates were not discovered until approximately 0720 and were manually closed by 0742. The resulting spill increased instream flows from approximately 195 cfs to 5,666 cfs (source – CDEC).

PCWA personnel initiated an Emergency Action Plan notification at 0740. Local emergency response agencies responded and evacuated the river channel. Known property damage at this time includes four small boats and a mining dredge. No injuries were reported. The river was reported running turbid during the release. PCWA indicated that it believes that some sediments were scoured from the reservoir and that the gravel recruitment spoil pile immediately downstream suffered some erosion. Environmental assessments and equipment investigations are on going.

Scope of Investigation – Dave Ward and Dave Barrett, Drum Switching Center Generation Supervisors, provided SCADA logs, operator logs, the black start notification, and operating information for Ralston Afterbay. The Drum operator on shift at the time of the incident was also interviewed.

PCWA's Steve Jones/Power Systems manager, Frank Nan/communications technician, Don Fleming/operator, and Dan Hounchell/operator, met with Kevin Goishi and Joe Minkstein of PG&E at Oxbow Powerhouse and Ralston Afterbay Dam on August 12, 2004, to review the incident and provided PCWA's SCADA logs, gage data, reservoir elevation data, operator logs, and drawings. Steve Jones subsequently provided a copy of an evaluation of the gate controllers performed by Sierra Control Systems, Inc. (copy attached)

Diagrams for the Ralston Afterbay float controller arrangement and Oxbow Powerhouse station service are also attached for reference.

Findings

1. Backup generator
   - Ralston Afterbay Dam is normally operated with power from Oxbow Powerhouse's station service. When station service power from Oxbow Powerhouse is cut off (e.g., during black start testing), a backup generator at the dam starts up automatically and provides power to the dam facilities

until Oxbow Powerhouse station service is restored. An automatic transfer switch at the dam is used to transfer from station power to the back-up generator source.

- No data was available to verify power quality during back-up generator transfer switch operations.
- Evidence indicates that the transfer switch failed sometime after the second generator start at 06:27:32. The open and close coils on the switch had holes in the coils and evidence of burning. The contacts showed some minor indications of arcing. The relays had been removed and were not available for inspection.
- The failed transfer switch was replaced immediately after the incident as part of PCWA's powerhouse restoration effort.

2. Gate Controllers
   - No data is available to verify what, if any, commands the gate controllers sent to the gate actuators during the incident.
   - Gate 1 & 4 controller operated many times during the incident, often in shorter intervals (12 sec.) than the controller supplier indicates is possible (600 secs. between operations per August 10, 2004 Sierra Control Systems, Inc. report).
   - Multiple times during the incident, the gate 1 & 4 controller operated both gates simultaneously, a function that the controller supplier indicates it is not capable of doing (*"Controller B can open gate 1 or gate 4, but not both at the same time"* per August 10, 2004 Sierra Control Systems, Inc. report).
   - Gate 2 & 3 controller did not operate gates 2 & 3 at all during the event even though it is setup to operate at lower reservoir levels than gate 1 & 4 controller.
   - Sierra Control Systems conducted an evaluation of the gate controllers and could find no malfunctioning equipment. While Sierra Controls simulated the black start conditions, it could not replicate the gate operations. Based on speculation that the failure had something to do with power transients in the 120AC source during black start testing, it recommends a DC power supply or uninterruptible power supply. (August 10, 2004 Sierra Control Systems, Inc. report)
3. Floatwells
   - Floatwell 1, which feeds the Oxbow Powerhouse float controller, has a 10' range. When water levels are below the 10' range, it does not provide an accurate indication on the powerhouse LED readout of the reservoir water level. Ralston Afterbay was below the operable range of floatwell 1 at the beginning of the black start testing.
   - Floatwell 2, which feeds the spillgate controllers, has a single float, but drives two separate Sierra Control Systems WLT80s. One WLT80 sends water elevation information to gate 1 & 4 controller and the other WLT80 sends water elevation information to gate 2 & 3 controller. No data is

available on the water level data that was sent by each WLT80 during the incident.

- Floatwell 3 which feeds water elevation information to SCADA at Ralston and Drum powerhouses was found to be hung up and sticking immediately after the gates were closed. Clearly erroneous Ralston Afterbay SCADA water level alarms were received at Drum beginning 26 minutes 54seconds after the first gate operation at 5:57 a.m. and persisted for approximately 1hr. 45 minutes into the incident. The float was freed and normal readings were resumed. PCWA's hydrographer speculates that it hung up during the rapid drawdown caused by the gate opening (personal communication-Steve Jones).
- No testing of the WLT80s has been initiated as of August 30.

4. Powerhouse black start capabilities
   - Black start capabilities is a new feature for Oxbow Powerhouse. The feature was tested unsuccessfully the week of July 26 (station service failed to transfer back to the main source following successful main generator restart). The original problem was corrected and this was the second test of the feature.
5. PCWA black start notification and testing
   - The testing was planned to be completed before rafter activity was expected to begin downstream.
   - The approved notification request did not specify limits of the black start test, only that the unit would be under local control for black start testing. The notification did not indicate whether the dam was included within the testing boundaries.
   - No written procedure was prepared for the testing.
   - There are no indications (lights or alarms) for spill gate operations in the Oxbow Powerhouse control room.
   - Spillgate open/close and water level elevation are available on PCWA's SCADA system, but there is no SCADA monitoring computer in the Oxbow Powerhouse control room. SCADA is available at Ralston Powerhouse, but it was unmanned during the testing period.
   - No personnel were stationed at Ralston Afterbay Dam during the testing to verify/facilitate backup generator function.
6. Drum Switching Center
   - Drum Switching Center was manned and receiving the SCADA alarms from Oxbow Powerhouse and Ralston Afterbay during the black start testing.
   - Drum operator disregarded Oxbow SCADA alarms since PCWA personnel were in Oxbow Powerhouse and had local control. The Drum operator believed the dam was included within the testing boundaries.
   - While acknowledging that spillgate open/close and water level alarms are not alarms that would be expected during normal black start testing, Drum operator indicated that it is normal to see unusual alarms since the

technicians often test features other than those specifically noted in the notification request.
- Drum operator was not aware that Oxbow Powerhouse control room had no indications for the spillgates or water level during the black start test.

7. Gate Actuators
   - No evaluation of the gate actuators was been made as of August 12.

Conclusions and Recommendations:

General – It is likely that the root cause was power transients resulting from the transfer switch operations. Due to the replacement of the switch, it is doubtful that the failure can be replicated under test conditions to conclusively identify the failure mechanism or the specific components that caused the gate to open.

The response to the spillgate opening was delayed due to inadequate communications prior to the commencement of the testing. Conducting the testing before hours of expected recreational activity was a prudent public safety decision made by PCWA personnel. Once the EAP was initiated, the emergency response was effective.

The specific conclusions and recommendations that are presented below should be utilized to develop a systematic action plan that will aid in the evaluation, modification or replacement of any equipment or procedures that are found to be contributors in this incident.

1. Backup generator
   - Conclusion – While we probably cannot replicate the incident, we believe the backup generator transfer switch probably played a key role in this incident. It has now been replaced.
   - Recommendation 1 - The power quality from the backup generator should be investigated both in normal operation as well as during transfer switch operations. Abnormalities, if any, should be corrected or, if within normal acceptable ranges, sensitive equipment (microprocessor-based) powered by station service should be identified and isolated.
2. Gate controllers
   - Conclusion - Gate1 & 4 controller malfunctioned during the incident, e.g., opened both gates simultaneously and operated within the 600 sec. reset period.
   - Recommendation 2 – Replace gate 1 & 4 controller. While no problems were found by the equipment supplier, it is clear that the controller did not function properly. Consideration should be given to replace gate 2 & 3 controller if the new gate 1 & 4 controller is significantly different in design or has significantly improved features.
   - Recommendation 3 – Change power supply to DC or add uninterruptible power supply.

3. Floatwells
   - Conclusion – Malfunction of the WLT80s has not been ruled out. The floats themselves are not likely to be factors in the incident. While the float in floatwell 1 was found hung up, it is likely that the float hung up as a result of the gate opening and closing. We do not believe the float was a likely contributor to the incident.
   - Recommendation 4 – Test all WLT80s to ensure that they are sending accurate signals. Check for carbon tracking which is known to be a maintenance problem with WLT80s.
   - Recommendation 5 – Extend the range of floatwell 1 (Oxbow float controller) to full range. This would be desirable, but not absolutely necessary if a SCADA monitor is installed in Oxbow Powerhouse control room.
   - Recommendation 6 – Consider changing floatwell equipment to DC power supply.
4. Black start capabilities
   - Conclusion – It is unknown if there is anything in the black start feature itself that contributed to the incident.
   - Recommendation 7 – Have third party engineer review the new black start feature design. PG&E engineering may be able to assist in this review.
5. Black start notification
   - Conclusion - The incident response was delayed by a misunderstanding between PCWA and the Drum Switching Center regarding the limits of the testing boundaries and the protocol for responding to alarms during the testing period. Although SCADA alarms indicated that gates 1 & 4 opened shortly after the testing began, the Drum Switching Center operator believed that PCWA operators in the Powerhouse would respond.
   - Recommendation 8 – Drum operators and PCWA personnel should review black start notification protocol to ensure that the test procedure and responsibility for response to alarms and indications during actual testing are clearly understood between the two groups prior to the start of testing.
   - Recommendation 9 – PCWA should monitor SCADA at Ralston Powerhouse during all instances of testing at Oxbow Powerhouse. If a SCADA monitor is installed in Oxbow Powerhouse control room, monitoring at Ralston may not be necessary.
   - Recommendation 10 - Spillgate open/close and full range water level indications should be installed in the Oxbow Powerhouse control room. A SCADA monitor could be installed in lieu of the spillgate open/close, but the full range water level indication would still eliminate any confusion in viewing the float controller LED readout.

6. Drum Switching Center
   - Conclusion - SCADA alarms indicated that gates 1 & 4 opened shortly after the testing began. Although the Drum Switching Center operator

acknowledged that the alarm was unexpected, he believed that PCWA operators in Oxbow Powerhouse would respond. The Drum Switching Center operator was not familiar with the physical configuration and equipment layout at the Oxbow Powerhouse and Dam and was not aware that the Oxbow Powerhouse control room did not have full access to alarms shown on SCADA.

- Recommendation 11 - All Drum Switching Center operators should meet with PCWA operators to familiarize themselves with the Project, the physical layout and the amount and types of indication that is available to the operators at each facility.
- Recommendation 12 – Drum Switching Center should meet with PCWA to review Emergency Action Plan procedures with specific emphasis on responsibilities on implementation.
- Recommendation 13 – Drum Switching Center should report all unusual or erroneous SCADA alarms to PCWA personnel for investigation as soon as practicable.

7. Gate Actuators
   - Recommendation 14 - Gate actuator circuits should be evaluated to determine if they could have played any role in this incident and, any problems found should be corrected.

Recommendation 15 – Consideration should be given to disabling the gate controllers between the Memorial Day and Labor Day holidays when rafting activity and river recreational use is significant. An assessment should be made to evaluate the risks of manual operation during this period. If it appears feasible, operating procedures should be developed and implemented to ensure that the gate controllers are returned to automatic operation at the appropriate times. Disabling the controllers during this period would minimize the possibilities of similar incidents in the future jeopardizing public safety.

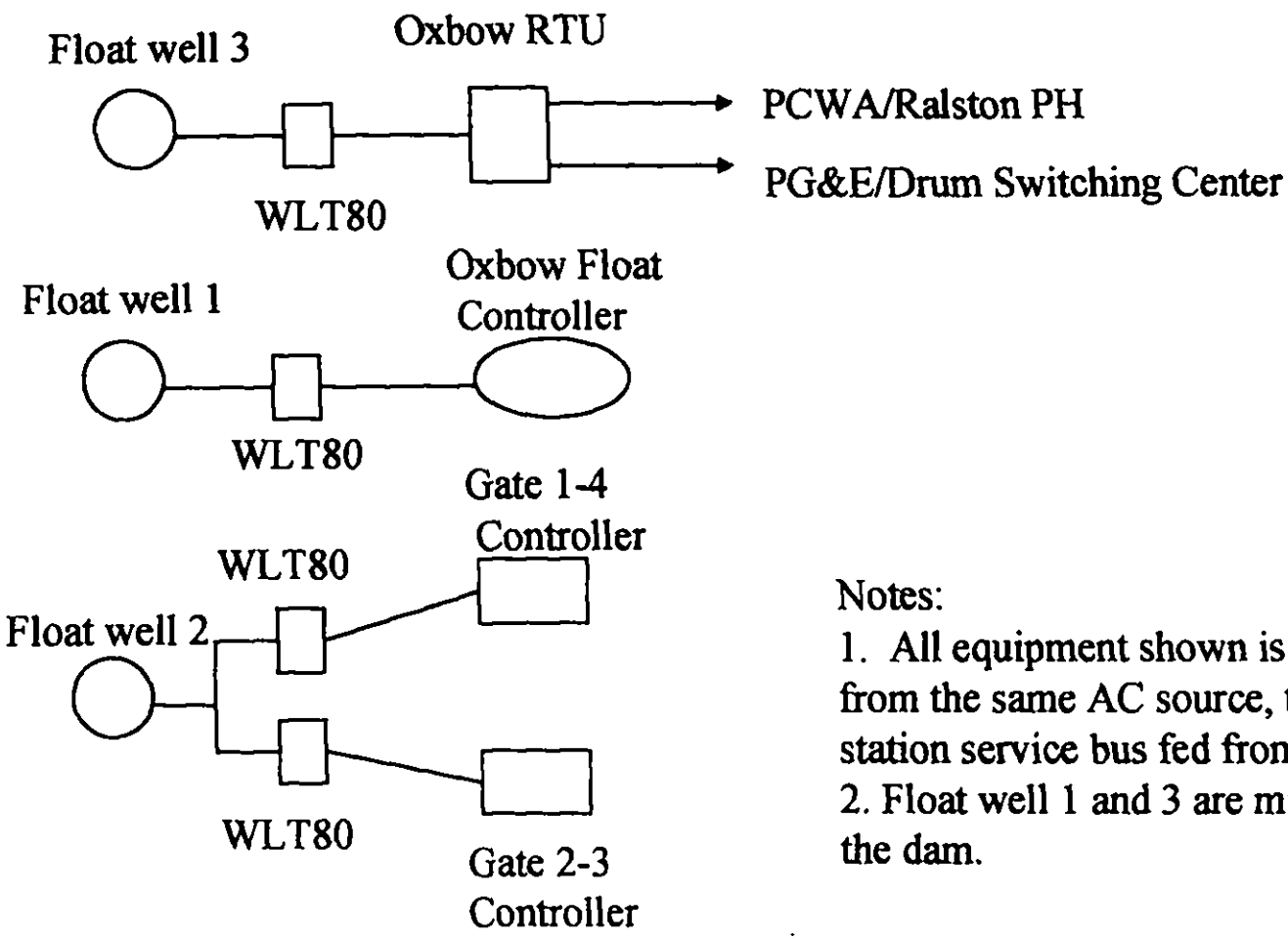
Kevin H. Goishi
Original signed 9/20/04

KEVIN H. GOISHI
Principal Project Manager - Irrigation District Contracts

Joseph Minkstein
Original signed 9/20/04

JOSEPH MINKSTEIN
Manager – Technical Services

Placer County Water Agency
Ralston Afterbay Spillgate/Float Controls



Notes:
1. All equipment shown is powered by from the same AC source, the Ralston ABay station service bus fed from the powerhouse.
2. Float well 1 and 3 are mismarked 3 and 1at the dam.