

MEMORANDUM

July 27, 2000

TO: Water District 37 File
FROM: Cindy Hodges
RE: Koyle Hydropower Plant

On July 13, 2000 I met with Watermaster Lee Peterson, John Koyle and Alan Koyle. The purpose of the meeting was to discuss the operation of the hydropower plant with respect to the flow fluctuation and bypass flow conditions contained in the water rights. After a brief discussion at Koyle's home, we toured the power facility.

The Koyle Hydropower Plant is a run-of-the-river facility with no water storage capacity except in the diversion canal. A low rock and concrete diversion dam has been constructed across the Big Wood River channel, and a canal of approximately one-half mile in length extends from the diversion dam to the penstock forebay. There are manually operated radial gates at the head of the canal, and a spillway at the forebay. A full measuring station with staff gage, continuous recorder and cable car was established in the canal during the 1980's but is not presently used. To determine rates of diversion for Water District billing, a monthly power generation report is submitted by Koyle to the District, and an average diversion rate is calculated from kilowatt rating information.

To ensure minimum bypass flows of 5 cfs in the Big Wood River which are required by the FERC license, two holes were bored through the dam just above the canal. Bypass flow is measured with a calibrated staff gage and a continuous recorder situated in the Big Wood channel west of the canal. Mr. Koyle checks the staff gage and keeps the record charts. Bypass flows are not reported to the Watermaster but records are available from Koyle if necessary.

The power plant contains three generation turbines which may operated independently or together in various combinations for maximum efficiency. The generators are rated at 45 cfs, 77 cfs, and 170 cfs at 58 feet of head (total 292 cfs). The facility is fully automated to start and stop generators depending on incoming flows. Discharge from the generators is made at the confluence of the Big Wood and Little Wood Rivers.

Alan Koyle (John Koyle's son) is preparing to take over the day-to-day operations of the hydropower plant. He admitted that, on a few occasions this year, automatic operation has not been properly set and the generators failed to shut down or start up when necessary, causing some inadvertent short-term fluctuations in river flow. He did not specify dates or the rates of flow involved. I advised that the plant must be operated without fluctuations, and was assured by both Alan and John Koyle that standard operating procedure for the plant was to keep automation on and the canal full so that in the event of a shutdown, spill would occur within a few minutes and river flows would not be impacted.

At the time of my visit, turbine #3 was in operation and the canal was full with about 4 inches freeboard on the spillway. Mr. Koyle estimated the flow at 150 cfs, although with full head on the canal the rated discharge for that turbine is closer to 170 cfs. Bypass at the

dam was approximately 9 cfs. According to Water District records for the day, available flow in the Big Wood River above the Koyle plant was approximately 190 cfs.

Significant river fluctuations in the Northside Z Canal and in the Malad River have been reported to the Department by Northside Canal Company and the Wood River Watermaster. Incidents occurring on June 23, July 4 and July 17, 2000 have been documented on continuous chart recorders at the Z Canal and at the USGS Malad River gage. On one date, crops were said to have been damaged due to flooding in the Z Canal when surging flows entered the canal and overtopped the canal banks. Northside Canal Company officials allege that operational surges from the Koyle power plant have caused the river and canal fluctuations. Headboards at the Z Canal are not designed to accommodate large fluctuations in flow, so changes in river stage are mirrored in the canal.

The Koyle hydropower plant could be manually (or mistakenly) operated in such a fashion that river fluctuations or surges would result, by emptying the canal at full generation then shutting down while the canal refills, although it is difficult to verify the magnitude of the downstream surge without actually witnessing such an event. It is also difficult to determine the economic benefit to the owners to operate in such a fashion. Total storage in the diversion canal is relatively small (2.3 acre-feet). At a theoretical inflow of 170 cfs and an outflow of 300 cfs (full capacity), the canal would empty in about 97 minutes, then would require another 75 minutes to refill, assuming the generators were not operating.

At this time, I have received from the Water District both daily and continuous flow data for the Northside X, Y and Z Canals, and the Big and Little Wood Rivers at Gooding, from June 1, 2000 through approximately July 17, 2000. I also have daily data (collected by the Water District) for the Malad River gage but complete continuous data will not be available for the summer until after August 15 when the USGS downloads the datalogger at that site. The continuous data are fairly consistent and show typical natural flow patterns in the rivers and constant diversions in both the X and Y canals. The Z canal, diverted from the Malad River approximately 7 miles downstream from the Koyle Hydropower plant, experienced a series of fluctuations from June 22 through July 4, and a more isolated event on July 17, when canal staff happened to be on site and were able to adjust the gates.

The capacity of the Z canal is approximately 100 cfs. Watermaster records note a diversion of 93 cfs for June 23, 2000, the day on which a series of flow fluctuations began. For that period, continuous data is also available for the Malad River, and flows were compared over five days from June 22 to June 26 (see attached charts). On June 23, a low flow of 20 cfs at 6:00 am in the Malad River is followed by a peak of 90 cfs at noon. In the Z Canal, extremes of 78 cfs and 115 cfs occur at the same times. Other matching fluctuations occur both before and after this event.

Since nearly identical fluctuations were experienced in the river, it is unlikely that the Z Canal surges were caused by canal operations alone. The Y canal, above the Koyle diversion, did not experience surges, and according to the Watermaster there are no other major diversions between Koyle and the Z Canal.

Further analysis on the other events is not possible until more data is received. Besides the Malad River data from USGS, daily or hourly power generation data from Koyle (as opposed to monthly data) would be critical in establishing whether Koyle was in fact fluctuating flows at the powerplant.