inter-office communication

to: Joseph J. Sommer, Director date: February 12, 1986

from: Robert L. Goettemoeller, Chief, Division of Water

subject: Buckeye Lake Dam and Spillway

I have attached a copy of a memo prepared by Bruce Pickens, Administrator of Dam Safety and Water Engineering for the Division, regarding the safety concerns of the Buckeye Lake dam and spillway as requested in your January 9 memo.

The bottom line is that this structure has deteriorated to the point that it is nearly time to lower the summer pool level of the lake in order to assure safety. If it is not possible to get $5 or $6 million in the capital's budget to fix this structure, we had better at least find $3 or $4 hundred thousand to make the user-type safety repairs and get the final detailed rehabilitation plans completed. This would allow more precise cost estimates to be made for total funding in the FY 89-90 capital improvements budget and allow immediate construction upon such appropriation.

RLG/djh

cc: Tom Sherman
Bruce Pickens
Stan Spaulding

Attachment

ODNR
OHIO DEPARTMENT OF
NATURAL RESOURCES

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Columbus, Ohio 43224

INTER-OFFICE COMMUNICATION

TO: Robert L. Goettemoeller, Chief, Division of Water

FROM: J. Bruce Pickens, Administrator, Dam Safety & Water Engineering

DATE: February 12, 1986

SUBJECT: Buckeye Lake Dam

This memorandum is in response to Director Sommer's January 9, 1986 request for a current report on the condition of the Buckeye Lake Dam. To ascertain the current condition of this structure, it was necessary to review past reports, meet with the engineering consultant currently performing a detailed study of the facility, and make a cursory inspection of the site.

Consultant Study

As you are aware, we contracted on March 20, 1985 with Dodson-Lindblom Associates to perform a comprehensive engineering study of the spillway and dam at Buckeye Lake. The results of this study will determine viable alternatives for providing adequate spillway capacity and needed remedial work to correct any seepage, stability, or other problems with the earth dam embankment. This study will form the basis for developing detailed plans and specifications for the rehabilitation of the Buckeye Lake Dam, including replacement of the spillway, and more fully identifying the cost thereof.

On January 24, George Mills and I met with representatives of Dodson-Lindblom to discuss the current status of their investigations and their findings to date. An earlier meeting had been held with them in late November, 1985 to review their preliminary findings with respect to the spillway capacity problems. Their preliminary findings confirmed our previous evaluations which indicated that the spillway capacity at Buckeye Lake is seriously inadequate. The existing spillway provides no more than about 10 percent of the required capacity for a dam of this magnitude. Their studies indicated that, without operation of the sluice gates, the spillway can only handle a 25 to 50-year flood resulting from a 6-hour duration storm. This flood routing is confirmed by the May, 1968 flood which required sandbagging of a portion of the dam crest to prevent overtopping. That flood was projected to be about a 25-year flood resulting from a storm event of a day or so. Many of the other major floods in the past 60 to 70 years occurred in winter or early spring when the pool level was probably lowered, or the storms just happened to miss the Buckeye Lake watershed.

As part of the engineering study, soil borings of the earth dam were completed during the week ending January 17. Laboratory analyses of soil samples obtained from the borings are underway to determine various soil properties and parameters for use in the consultant's seepage and stability analyses. As the results of these analyses will likely impact the overall results and recommendations of the study, the consultant indicates that the draft of their final report will be completed in about 3 months.

At this time, it is known that alternative plans for a new spillway of significantly larger size will be recommended. Due to the complexity of the topography including the locations of existing dwellings, buildings, roads, and other structures, determining the final location of a new spillway will be difficult at best.

Field Observations

On February 5, 1986, I made cursory observations of the spillway and other selected features at Buckeye Lake to ascertain their current conditions. The following observations were made:

Spillway

1. The lake level was about one foot below summer pool level. The east (right) sluice gate appeared to be almost fully open.

2. Surficial deterioration of the spillway concrete is continuing. In two of the bays, the upstream half of the weir crest at the base of the flashboard had been spalled (eroded) away. Since the summer pool level is maintained a few inches up on the flashboards, some problems with leakage under the flashboards and difficulty in maintaining the desired summer pool level may be experienced as the concrete deterioration further erodes the weir crests.

3. A semicircular steel plate shield had been placed around the control mechanism for the middle sluice gate.

4. The vertical supports of the steel pipe safety rail along the upstream side of the bridge which crosses the spillway had rusted through, providing little or no protection to pedestrians on the bridge.

Outlet Gate to Fish Hatchery

5. The open top of the intake chamber to the gate was not fully covered. The cover, comprised of wooden planks, did not extend over the entire opening, had large spaces between planks, and appeared to be of questionable condition.

Sheet Piling Shore Protection

6. Little or no change from previous observations were noted. However, the sheet piling receives added stress from docks, boats, etc. cantilevered directly from the piling. The piling was not designed nor built for this kind of use, and its long-term structural integrity may be compromised accordingly.

Discussion and Recommendations

As has been noted in previous reports over the past several years, the spillway at Buckeye Lake is seriously inadequate and requires replacement and substantial enlargement to adequately provide for the safety of the dam. In addition, remedial measures to the earth embankment and other appurtenances are necessary to fully upgrade this structure to reasonable modern-day standards. A "band-aid" approach to correcting the deficiencies with the Buckeye Lake dam and spillway will not continue to work. As the Director correctly indicated in his memorandum, rehabilitation of the dam and spillway at Buckeye Lake is "a major undertaking requiring four to five million dollars and that any amount less than this would not be satisfactory." In fact, the final cost may well exceed five million dollars.

The Director further indicated that Senator Branstool and Representative Guthrie wanted "to have some assurance that the dam is reasonably safe and would like to know if there is anything that can be done to reinforce the current structure, and the approximate cost of the reinforcement." With the known spillway deficiencies as confirmed by the current consultant study, the dam cannot be deemed reasonably safe. Unless complete repair and rehabilitation can be accomplished in the forseeable future, the condition of the structure may deteriorate to the point where extreme measures such as lowering the summer pool level may be required to protect life, health, and property.

As far as reinforcement of the existing structure, repairs to the spillway handrail and the intake chamber for the outlet gate to the fish hatchery are promptly needed to protect the public accessing these areas. In addition, some formal procedures for operating the five sluice gates in the spillway to provide a nominal increase in the overall capacity of the spillway can be developed and instituted. However, any required operation of these gates to increase spillway capacity would, at some point, likely result in the flooding of properties bordering the spillway outlet channel. Also, the actual operating condition of all five gates is not known and needs to be determined so that any necessary repairs to these structures can be implemented.

If necessary funding for complete rehabilitation of the Buckeye Lake dam will not be available in the upcoming two-year capital appropriation, it is imperative that certain other measures be undertaken. As a minimum, I would recommend the following:

1. Required repairs to the handrail, gate chamber, and other structures subject to public access should be implemented as soon as possible;

2. A formal operation plan for the spillway gates should be developed and implemented;

3. A detailed, written Emergency Action Plan as required for all major dam structures should be prepared;

4. Any repairs necessary to make the existing five spillway sluice gates fully operable should be designed and completed;

5. Semi-annual inspections of the dam, its spillway, and other appurtenances should be made; and

6. Detailed plans and specifications for full rehabilitation of the dam and the spillway should be developed.

The costs of implementing the noted minimal repairs and operation changes and developing detailed plans and specifications for full rehabilitation of the Buckeye Lake dam and spillway are difficult to estimate, but would probably be on the order of $300,000 to $400,000. By proceeding with development of detailed design plans and specifications in the next year or so, much better cost estimates for the complete rehabilitation of the dam and its spillway will be available for inclusion in the FY89-90 capital appropriations bill. Furthermore, this action would permit the eventual construction of the rehabilitation measures to proceed as soon as funds become available.