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FEDERAL ENERGY REGULATORY COMMISSION
Office of Energy Projects
Division of Dam Safety and Inspections - Chicago Regional Office
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In reply, refer to: P-10809

July 21, 2020

Via Electronic Mail

Mr. Lee Mueller
Boyce Hydro Power, LLC
lwmueller@boycehydrollc.com

Re: Secord Hydroelectric Project No. 10809
Secord Dam Emergency Inspection Report – June 25, 2020

Dear Mr. Mueller:

Your July 8, 2020 letter belatedly provided the June 25, 2020 Secord Dam Emergency Inspection Report prepared by TRC Engineers Michigan, Inc. (TRC). The inspection report summarizes the visual observations of the Secord Dam made by TRC on June 9, 2020. It is noted that Boyce Hydro did not have the Chief Dam Safety Engineer (CDSE), Mr. Purkeypile - listed in the Owners Dam Safety Program (ODSP) (Revision 6, dated July 2018), inspect the project at the time of the failure.

A May 20, 2020 letter from the Director of the Division of Dam Safety and Inspections required dam safety inspections of the Sanford, Secord, and Smallwood Dams be performed within three days of flood flows receding and provide inspection reports within 3 days from the dates of the inspections. Flood flows had fully receded and reservoir elevations were at or below normal levels by May 20 for the Smallwood Project and May 22 for the Secord Project. The required inspections did not begin until June 8, 2020, at least 17 days after the projects could have been inspected. An inspection report for the Smallwood Project was filed on June 30, 2020 and we provided our review comments on this submittal by letter dated July 15, 2020. We have not received an inspection report for Sanford Project as of the date of this letter.

The inspections were performed by Mr. Shawn D. McGee, P.E. and Mr. Chris Hay, P.E. of TRC. By letter dated June 30, 2020, you submitted a revised ODSP which now designates Mr. McGee as the CDSE of the Boyce Hydro projects. Our review of your ODSP submittal will be provided in a separate letter.

Our comments on the inspection report are in Enclosure 1. We highlight our comments on seepage of the left embankment, sloughing of the right embankment, toe drain inspections, and inadequate spillway capacity (comments 11, 13, 14, and 18) which indicate inadequacies with the dam in its current state.

TRC's recommendations include completing several construction activities. Construction documents (e.g. final plans and specifications, supporting design report, Quality Control and Inspection Program, Temporary Construction Emergency Action Plan, Soil Erosion and Sediment Control Plan) for these construction tasks must be submitted for our review and authorization before any construction may proceed.

A supplemental report by TRC addressing the comments provided in **Enclosure 1** of this letter must be submitted by **August 20, 2020** and include a plan and schedule to address TRC's recommendations from both the original inspection report (as listed in **Enclosure 2** of this letter) and the supplemental report.

As you are aware, the dam cannot safely pass the Inflow Design Flood (IDF), the existing embankments and abutments will be overtopped (the IDF is the Probable Maximum Flood as required by FERC Engineering Guidelines). Boyce Hydro provided a 50% Design Report for Additional Spillway Capacity by letter date April 24, 2020. We are still reviewing this submittal and will provide comments separately.

The reservoir cannot be returned to normal levels until you receive authorization from FERC and unless all of the outstanding dam safety items are satisfactorily addressed.

You may contact me at 312.596.4430 if you have any questions or concerns pertaining to this letter.

Sincerely,

John A. Zygaj, P.E.
Regional Engineer

Enclosures 1 and 2

Enclosure 1
Additional Information Needed for
TRC's Secord Inspection Report

The following items must be performed and addressed by TRC in a supplemental report:

General

1. Review pre-flood event photos, from all sources, and drawings and cross-sections and compare them to the conditions currently observed, especially the embankments. Any section that shows physical change from previously approved designs should be surveyed and re-evaluated for stability and factors of safety.

2. Review and evaluate all data pertaining to the project operations, spillway gates, reservoir levels, generation, and total outflows throughout the flood event.

3. Provide headwater and tailwater elevations at the time of the inspections.

4. Provide commentary on the construction techniques and materials of the dam with regard to how the dam performed during the flood.

5. Complete a dive inspection of the tailrace slabs of the spillway slab and powerhouse to check for undermining. The December 31, 2016 Part 12D inspection report recommended the dive inspection of these structures after the spillway gates are opened more than 7 feet. According to the July 2, 2020 12.10 Incident report, the Secord gates were opened more than 7 feet. Include the underwater inspection of the training walls and piers, and the condition of previous repairs of the undermining at the juncture of the powerhouse and spillway tailrace slabs, and the downstream east corner of the spillway tailrace slab.

6. Include an evaluation of downstream scouring based on the underwater inspections completed prior to and after the May 19, 2020 flood event.

Embankments (Right and Left)

7. Provide a survey of the embankment slopes and compare with the original design.

8. Provide stability analyses accounting for the surveyed embankment slopes to determine if adequate factors of safety exist.

9. Provide commentary on the original embankment construction techniques and materials.

10. Review the piezometer data to evaluate embankment performance during the May

2020 flood event and any possible influence on stability of the structure. Include the current status/condition of all monitoring instruments.

11. The left embankment seepage has not been previously observed. The seepage was observed even while the reservoir was drawn down, which indicates that it could be a greater issue at normal pool. The seepage area should be investigated. Provide the following:

    a. A scaled plan view drawing showing the surveyed location and extent of the seepage outbreak and location of existing toe drains, along with scaled representative cross sections of the wet slope areas.

    b. Detailed evaluation of the root cause of the seepage, identifying the factors contributing to the seepage outbreak. Include the evaluation of available documentation on previous seepage outbreaks.

12. Review the adequacy of the erosion protection along embankment downstream toe, spillway wall and upstream slope in accordance with current dam safety practices. Include photos of the riprap materials with objects of known dimensions for scaling purposes. Also, confirm if there is bedding material under the riprap.

13. Regarding the sloughing reported on the downstream slope of the right embankment, in addition to the slope movement instrumentation recommended by TRC (recommendation R-4), provide the following:

    a. A scaled plan view drawing showing the location and extent of the sloughing, along with the location of the existing toe drains, and scaled representative cross sections of the sloughing. The plan view and cross sections should be based on survey data of the affected areas collected after the May 19, 2020 flood event.

    b. Detailed evaluation of the root cause of the sloughing, identifying factors contributing to the potential slope movement. The TRC inspection report (Section 3.3, page 17) indicated that "[t]his type of sloughing is considered "normal" for an earthen embankment of this age". It is noted that dam embankments should be maintained free of sloughing signs regardless of their age. Neither the December 31, 2016 Part 12D inspection report nor recent FERC annual inspections noted evidence of sloughing. Also, the Dam Safety Surveillance and Monitoring Report filed on March 24, 2020 did not report any sloughing incident. This contradicts the TRC report, which indicated that "it did not appear that the sloughing was recent".

14. Include a detailed description of the original toe drains and of any repairs including the PVC screened pipe retrofits completed with the intent to control embankment internal erosion. Also, perform a video inspection of the full length of the toe drains located along drainage ditch areas noted in the TRC inspection with transported embankment sandy material. The video inspection should detail the conditions of pipe joints and drain screens. The field assessment should include the visual inspection of the connection of the PVC pipes with the original clay tiles.

15. Regarding the right embankment area next to the spillway, confirm if there was any erosion impact on the right embankment downstream slope due to water splashing that results from spillway flows hitting the struts.

Spillway Structure

16. Include documentation and photographs of the inspection from the internal spillway gallery of the headwater/rollway slabs, piers, and abutment walls.

17. Provide commentary on the top and bottom elevation of the spillway chute cutoff sheetpile walls relative to the May 2020 flood and the expected peak IDF pool. Also review the piezometer data from the May 2020 flood event to evaluate performance and any possible influence on the stability of these structures.

18. Given that this flood was far less than the IDF, provide commentary on the project's ability to safely pass the IDF. Include a review of the operating procedures during the May 2020 flood to aid in the assessment. Provide an estimate of the return frequency for the project's existing spillway capacity accounting for the May 2020 flood. Based on this estimate and the dam's performance during the recent flood, provide any recommended interim risk reduction measures until sufficient spillway capacity is added to safely pass the IDF

19. Include inspection documentation and photographs of the mechanical and electrical components of gate hoist equipment, including onsite electrical generators.

20. Provide observation/indication of seepage through the gap between the cutoff wall and the concrete structures.

Powerhouse Structure

21. Include inspection documentation photographs from inside the powerhouse, including the water bearing walls (i.e., headwalls) and the turbine chamber.

Enclosure 2
Recommendation Follow-up Actions from the TRC
Inspection Report of Secord Dam

Critical Action

C-1 The Secord Focused Spillway Inspection Report dated November 30, 2018 referenced a hole in the right (west) concrete retaining wall at the base near the downstream toe of slope. This hole was also observed during the post-flood inspection by TRC on June 9th. It appears to be the source of back fill erosion contributing to a void behind the wall…It is recommended that the wall be repaired as follows:

> Lower the tailrace water level for a period of time sufficient to clear debris from the base of the existing retaining wall and prepare a uniform surface for installation of concrete forms located approximately 2-3 feet away from and parallel to the existing retaining wall. Install formwork for the entire length of the existing retaining wall to a uniform height of approximately 3 feet to ensure coverage above the existing hole and provide a closure form at the end of the existing retaining wall. Install dowels in the spillway slab and the side of the existing retaining wall and install a rebar cage tied to the dowels. Pour the form with concrete. Allow appropriate cure time and then remove the forms and re-water the tailrace.

Recommended Action

R-1 Repair the southernmost floor beam supporting the powerhouse. The exposed reinforcing steel is showing signs of corrosion and section loss. Due to its position at the beam fascia, it is exposed to the elements and will continue to deteriorate, possibly at an accelerated rate.

R-2 Repair the spall/undermining of the east wingwall (bulkhead). The exposure of the steel sheet piling can start to corrode due to the moisture present at the site. Extended exposure could lead to failure of the connection between the concrete cap and the steel sheet piling below.

R-3 Backfill voids behind the retaining walls…

R-4 To *ensure* that the right downstream slope is not actively moving, it is recommended that survey hubs be installed along the slope (at the crest, toe, and midslope) to monitor the slope for additional movement - the survey hubs should be initially monitored every other week.

R-5 Repair the erosion damage that was observed at the downstream toe of slope at the end of the right concrete wingwall and on the right and left downstream riverbank above the riprap. The erosion does not appear to be an immediate threat to dam safety, but should be repaired when feasible…

Non-Critical Action/Maintenance Items

M-1 Remove the trees, cattails and other overgrowth along an approximate 50 foot long section of the far left of the embankment near the left abutment. Once this vegetation is removed, repair the surface sloughs and erosion damage at the toe, and replace the riprap...The dead and fallen trees should continue to be removed as part of regular maintenance activities. Stumps should be removed by either pulling or with machines that can grind them down. All woody material should be removed to about 6 inches below the ground surface and the cavity backfilled with well-compacted clayey soil and grass vegetation established.

M-2 Clean and repair concrete deterioration to retaining walls and wingwalls (bulkheads). Repairs include cleaning concrete surfaces, patching spalls and delaminated areas, and epoxy-injecting cracks. This will slow the rate of deterioration and extend the service life of the dam.

M-3 Clean and paint remaining steel equipment supports on the deck. Cleaning and painting should slow or stop active corrosion and extend the usable life of the structures.

M-4 Place additional riprap on the upstream slope near the right abutment.

M-5 Perform maintenance of the vegetative cover throughout. Removal of improper vegetation is necessary for the proper maintenance of a dam. All vegetated embankment slopes should be maintained with a maximum grass height of 12 inches…Common methods for control of vegetation include the use of weed trimmers or power brush-cutters and mowers. Chemical spraying to kill small trees and brush is acceptable if precautions are taken to protect the local environment. It is important to remember not to mow when the embankment is wet.

M-6 Although rodents or burrow holes were not observed during the site visit, it is likely they are present. Continue to maintain proper rodent

control throughout...They (rodents) are usually discouraged from inhabiting the embankment if the vegetative cover is kept mowed as previously discussed. The rodents can also be controlled by fumigants, trapping or shooting during the appropriate season - local laws and regulations should be checked before trapping and/or hunting. If a burrow or den is observed, it is recommended that it be backfilled by mud-packing - pour a mud-pack mixture (i.e., a slurry consisting of 90% soil and 10% cement mixture) with the aid of a pipe into the hole with dry soil tamped into the entrance and vegetation re-established.

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