Memo

Stantec

To:	Michael Chelminski Topsham ME Office	From:	Rick Schultz Topsham ME Office
File:	Field Observation Report	Date:	October 14, 2012

Reference: Orland Village Dam – Condition Assessment

This memorandum summarizes the field observations and recommendations related to a visual assessment of existing conditions at the Orland Village Dam. This assessment was intended to be a general review of dam structure to identify potential areas of concern that would impact the Orland Village Dam Alternatives Feasibility Study.

The visual assessment was conducted on September 28, 2012 between the hours of 2:00 and 6:00 PM to coincide with a predicted -0.2 foot low tide at 4:18 PM. In preparation for the site visit, the gates were opened by the local dam operator to provide headwater drawdown estimated at 1.5 to 2.0 feet below normal water surface. With relatively low water on both upstream and downstream sides, most project features were visible and readily accessible.

Summary

The overall condition of the dam appears to be good, stable, and well maintained. The spillway timbers exhibit good alignment and uniform section loss. The rock ballast is adequately sized and appears stationary. The gates are in fair to poor condition from an operational point of view, but appear to pose little threat to dam safety. There is obvious movement of surface cobbles in the tailrace, but the plunge pool at the spillway to appears adequate without obvious signs of bedrock scour.

The primary identified concerns with this facility include the rock fill upstream of the spillway which diminishes spillway capacity and resulted in reduced seepage through the upstream face which exposes the timber cribs to wet/dry cycling. There are signs of movement at the left abutment and spillway crest which should be monitored to confirm if this is active movement or a result of past construction activity; and the there is some concern that failure of the downstream alewife trap could compromise integrity of the left embankment.

Project Features

The Orland Village Dam is founded on bedrock and consists of concrete retaining wall abutment on the left bank, an estimated 130-foot-long by 12-foot-high timber crib spillway, and a 50-foot-long concrete non-overflow gate structure which serves as the right abutment and incorporates upstream and downstream fish passage. Project drawings were not available at the time of this site visit, but sketches and rough

measurements taken during the site visit are included as attachments and referenced in this memorandum.

The timber crib spillway was constructed using 8x8 timbers to form typical 6-foot-crib bays filled with 12 to 18 inch fractured rock ballast[1]. There are 8 bays adjacent to the left abutment, a single drawdown bay in the central portion[2], and 13 bays adjacent to the non-overflow spillway. The downstream face is vertical open crib while the crest and upstream face are covered with 4 inch by 6 inch planking. The 6-foot-wide crest transitions to what appears to be a 1:1 upstream slope. The upstream face was recently covered with a concrete overlay and rock/gravel fill.

The concrete non-overflow structure transitions from a 12-foot-high spillway abutment to a 5-foot-high gravity section on the right bank. There is a single 2-foot-wide pier separating two 8-foot-high by 4-foot-wide gate bays. The left gate bay contains a manually operated vertical slide gate used for headpond regulation, and the right gate bay contains a post-installed fish passage structure. The spillway abutment appears to be monolithic with the gravity structure and gate bays, but the concrete overlay placed during the 1984 reconstruction likely conceals vertical and horizontal joints.

Condition Assessment

Spillway General

The spillway condition appears good. There were no signs of significant movement, misalignment, deterioration, or localized damage. There is an obvious downstream bow in the spillway alignment which was measured at 2 inches over 130 feet, but it is unclear whether this is due to movement or original construction. There is minor seepage and build-up of transported fines and/or concrete paste at the right abutment and central portions of the spillway, but this is not considered unusual for timber crib structures founded on rock unless significant changes in the volume of deposits are observed over time. There was no water “leakage / seepage” observed on the downstream face which is a concern at this site since an eleven foot tidal fluctuation and no water flow through the crib structure exposes the timbers to repeated wet/dry cycles which accelerates timber deterioration.

Spillway Timbers & Ballast

The timbers and rock ballast condition appears good and stable. No large voids in the ballast or crib bays that appear partially filled cribs were observed. The crib members and connections show good alignment, deterioration of timber surface appears uniform, and only one moderate split was noted at the location shown on attached sketches. The timbers exhibit raised grain and uniform

[1] A small percentage of smooth rock was observed as part of the ballast mix.
[2] The drawdown bay is nonfunctional at this time and it appears this was sealed as part of prior dam maintenance or modification.

section loss with knife penetrations of ¼ inch and ½ inch respectively on side grain and end grain. With loss of surface material and random sampling of knife penetrations, section loss is estimated at ¾ inch from each face. The timber planking on the crest is oriented in the longitudinal direction and is in good condition. Side faces are butted tight along the majority of the crest but show signs of separation between planks on the left end of the spillway (see spillway abutment for elaboration).

Spillway Abutments

The right abutment appears monolithic with the non-overflow section and appears stable and in good condition. There is minor surface erosion at the base of downstream faces and at the normal water surface elevation, but significant undercutting was not observed. Minor surface cracking was observed on the side and top faces (especially near corners and handrail attachments), but these appear to be cosmetic rather than structural concerns at this time.

The left abutment is a retaining wall type structure built into the left embankment. The concrete appears to be in good condition, but there are signs of instability which should be monitored. Recent rock fill has been placed adjacent to and downstream of the abutment which indicates historic seepage around the abutment. There is separation between the abutment face and spillway timbers (see attached photo), and there are gaps between the spillway planks over a 20-foot-length of spillway crest. These observations suggest that the abutment has moved toward the embankment or the spillway is pulling away from the abutment[3].

Gate Structure

The gate structure is in overall fair condition, with the majority of concern related to the gates and pier. The concrete gravity sections as a whole appear to be in good condition with only minor surface cracking and surface deterioration of the upstream face at the normal water surface elevation and no obvious signs of movement or instability. However, concrete erosion was observed on the downstream side at the concrete/rock interface with minor undercutting in some locations and concrete placements which appear to be repair attempts or preventative maintenance. There were also significant cracks and spalls observed at the base of gate slots which could impact gate operation. The gate bays and right abutment are also relatively short and light weight gravity sections which are typically susceptible to instability under ice loading and flood conditions. Although condition is considered fair, there are no obvious downstream hazards affected by gate or pier failure.

[3] In this case, the former is suspected and may have occurred due to lateral loading from ballast with bankside fill removed.

Headpond & Spillway Capacity

The headpond was estimated at 1.5 to 2 feet below normal based on level of the spillway crest and observations of moss and concrete deterioration on the upstream face of the non-overflow sections. The channel leading to the gate structure is fairly narrow and shallow either from siltation or natural river contour. The area upstream of the spillway is very shallow with rock/gravel fill place to within 6 inches of the spillway crest and extending approximately 30 feet upstream where it blends into river bottom sediments. This fill placement effectively changes the spillway from a 6 foot wide "short crested weir" to a much wider and rougher "broad crested wier" and may diminish spillway capacity.

Tailrace

There is a well-defined "plunge pool" along the entire length of the spillway which is approximately 4-feet-deep and extends an average of 30 feet downstream where deposits of large cobbles occur. The bedding planes in the shale-type bedrock are within 30 to 40 degrees of vertical, but there are no obvious signs of scour or rock instability near the toe of the spillway. Residents in the area reported that rock is periodically place downstream of the spillway which is consistent with observed cobble deposits downstream of the dam.

There is an alewife trap built into the left embankment just downstream of the dam which is a combination timber crib and pile construction. This structure appears to be in poor condition with obvious signs of movement, deterioration, and historic repairs. Although the alewife trap structure was not a focus of this assessment, collapse of this structure could potentially affect left bank stability and compromise the integrity of the left abutment.

Gates and Fish Ladder

The gates and fish ladder have been recently maintained and/or modified. The right gate bay is complexly occupied by the fishladder and flow is regulated with the manually operated timber slide gate. The left gate bay is used for headpond regulation utilizing a manually operated timber slide gate, however the 7.5-feet-high by 4-feet-wide gate has minimal capacity to pass high flows. Stoplog slots are available downstream of the slide gates, but their effectiveness is questionable due to deterioration and spalling at the lower end of gate slots.

Dam Safety & Stability

Transfer of Ownership of the dam from Verso Paper to the Town of Orland occurred in 2010, but there were no previously performed Condition Assessment, Dam Safety Inspections, or Stability Analyses available for review at this time.

For the purposes of dam safety, The Orland Village Dam is under the jurisdiction of State of Maine Department of Defense, Veterans and Emergency Management. According to Maine Revised Statute Title 37-B, Chapter 24: Dam Safety; this dam is classified as a "Low Hazard Potential Dam" where failure or errors in operation results in no probable loss of human lime and low economic and environmental losses. Because of this classification, there are no specific requirements for dam safety evaluation[4] other than on-site inspection by the State Dam Inspector at 6 year intervals.

Recommendations

The following recommendations are provided to address dam safety issues and continued operation:

1. Contact Maine Emergency Management Agency to confirm the dam classification and obtain a copy of the most recent inspection report prepared by the State Dam Inspector, or the U.S. Army Corps of Engineers inspection report from the 1981 USACE Inventory of Dams. Notify Stantec immediately if the dam is classified as something other than "Low Hazard Potential".

2. Establish benchmark and procedure for monitoring and recording potential movement of the left abutment, spillway alignment, and gaps between crest planks on left end of spillway. Monitoring should differentiate between seasonal fluctuation and progressive movement.

3. Quantify diminished spillway capacity resulting from upstream fill. Estimate relative impact this will have on typical headwater levels during high flows.

4. Establish baseline measurement of rock along the spillway toe to monitor scour potential.

The following observations are provided for consideration when preparing the Alternative Feasibility Study.

1. Cost and operational considerations will increase if "economic loss or environmental impact" associated with dam failure causes this facility to be reclassified as "Significant Hazard Potential".

2. Modification of the gate structure to accommodate fish passage will likely require submittal of design calculation and stability analyses using current guidelines. To satisfy more stringent criteria, new construction will likely be more robust than the current configuration.

[4] Stability Analyses, Spillway Capacity Rating, Emergency Action Plans are not required by Maine Revised Statute for "Low Hazard Potential Dams"

3. Flood levels and spillway capacity will have to be evaluated if significant repairs or modifications are proposed.

This assessment and recommendations were based on a visual inspection and engineering judgment acquired through experiences at similar facilities. If additional information or prior assessments are made available which contradict these findings, additional recommendations may be necessary.

STANTEC CONSULTING SERVICES INC.

Rick Schultz
Senior Engineer
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Attachment: Field Sketches
Site Photos (not included with this draft)
USACE National Inventory of Dams data sheet

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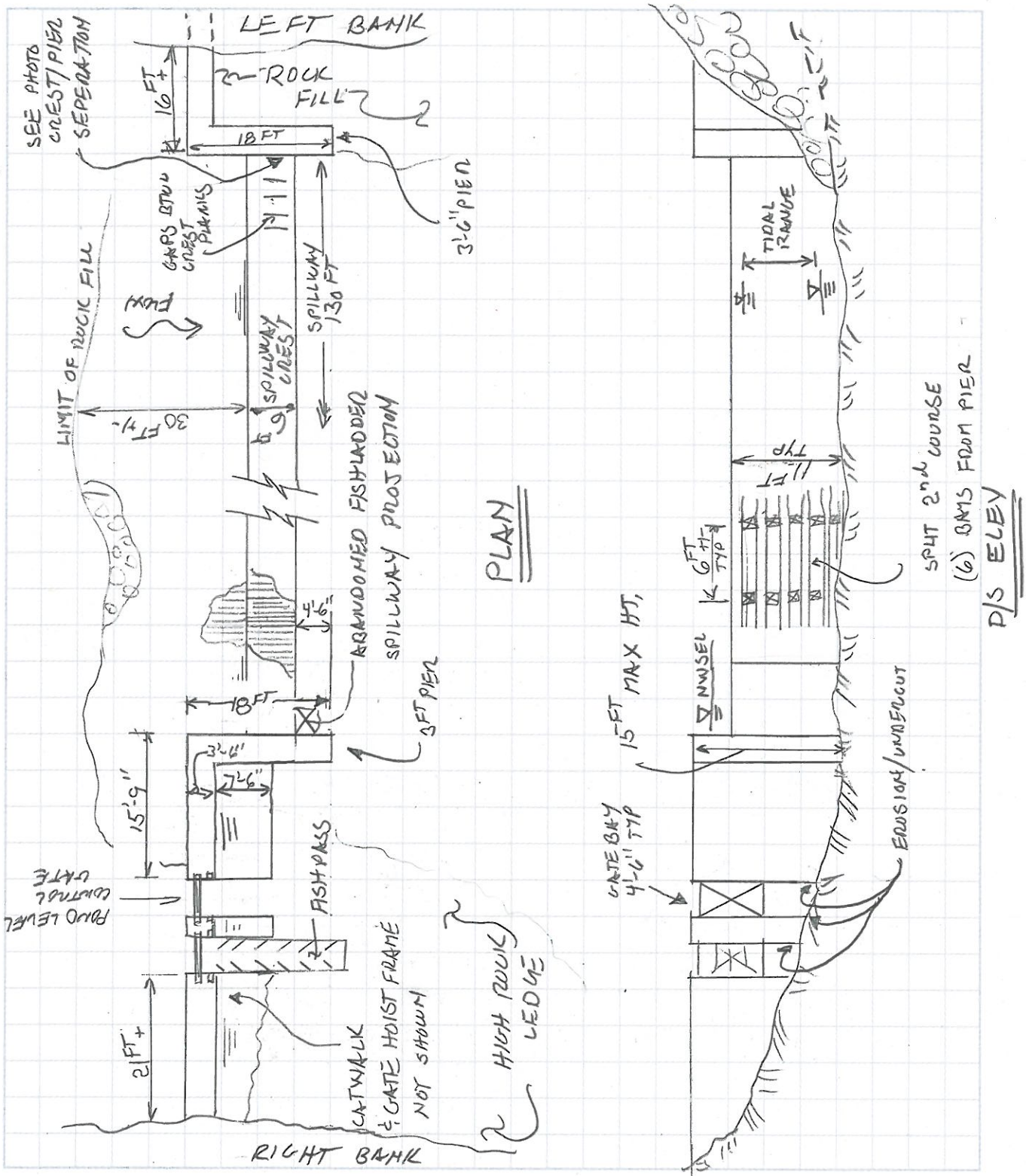
Stantec

ORLAND VILLAGE DAM
FIELD SKETCHES



Designed by: RICK SCHULTZ 10/12/12 Checked by:

Instructions on using NID Interactive Reporting

NID Detail Report

Report View < > Row 4 of 9 Exclude Null Values Displayed Columns

Dam Name	Orland Village
River	Narramissic River
State	ME
County	Hancock
NID Height (Ft.)	15
Dam Length (Ft.)	211
Owner_Name	International Paper
Private_Dam	N/A
NID Storage	180
Max Discharge	0
Max Storage	180
Drainage_Area	0
Longitude	-68.7433
Latitude	44.57
Dam_Designer	N/A
Core	
Foundation	
EAP	NR
Inspection_Date	
Spillway_Type	
Spillway_Width	0
NIDID	ME00148
Owner Type	Private
Dam Type	
Primary Purpose	Other
All Purposes	Water Supply, Recreation, Other
Other Dam Name	
Inspection Frequency	0
Dam Height (Ft.)	0
Structural Height (Ft.)	15
Hydraulic Height (Ft.)	15
Surface Area	1
State Reg Dam	N
State Reg Agency	MEMA
Year Completed	1930
StateID	394
Section	
Year Modified	
Outlet Gates	
Volume	0
Number Of Locks	0
Length Of Locks	0
Width Of Locks	0
Fed Funding	
Fed Design	
Fed Construction	
Fed Regulatory	
Fed Inspection	
Fed Operation	
Fed Owner	
Fed Other	

Source Agency	ME
Submit Date	06\26\2008
Congressional District	ME02
Political Party	D
Normal Storage	144
Congressional Rep.	Michael Michaud (D)
Other Structure Id	
Url Address	
Number Of Separate Structures	0
Permitting Authority	
Inspection Authority	
Enforcement Authority	
Jurisdictional Dam	

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