Hi Theresa. Our H&H team evaluated several spillway modification alternatives with the goals to pass the design storm and not increase downstream impacts as presented in the following table:

Scenario	Description	Starting WSE (ft-NAVD88)	Peak Discharge (cfs)	Peak WSE (ft-NAVD88)	Freeboar (ft)
Existing	Existing	1394.6	351	1400.0	-0.1
Alt 1	Armor existing for overtopping	1394.6	351	1400.0	-0.1
	Change from Existing	0	0	0.0	0.0
Alt 2	Lower existing P/S inlet invert 2.6 ft	1392.0	179.6	1398.3	1.6
	Change from Existing	2.6	-171.4	1.7	-1.7
Alt 3	Lower inlet invert 2 ft and upsize to 4-ft wide by 5-ft tall box culvert	1392.6	294.2	1398.3	1.6
	Change from Existing	2	-56.8	1.7	-1.7
Alt 3A	Lower inlet invert 1 ft and upsize to 7-ft wide by 5-ft tall box culvert	1393.6	428.3	1398.8	1.1
	Change from Existing	1	-77.3	1.2	-1.2
Alt 3B	Upsize to 45-ft wide by 5-ft tall box culvert	1394.6	1184.4	1398.4	1.5
	Change from Existing	0	-833.4	1.6	-1.6
Alt 4A	24-hr drawdown using 48-in LLO	1393.5	273.1	1399.3	0.6
	Change from Existing	1.1	77.9	0.7	-0.7
Alt 4B	48-hr drawdown using 48-in LLO	1392.6	213.3	1398.7	1.2
	Change from Existing	2	137.7	1.3	-1.3
Alt 5	Dam removal	1386.3	1225.6	1390.4	9.5
	Change from Existing	8.3	-874.6	9.6	-9.6

The following is a brief summary of each alternative above:

Alternative 1 – Armor the Downstream Slope: This alternative includes maintaining the existing spillway elevation and therefore maintaining existing norma lake levels. Improvements would not be made so that the spillway could pass the design storm. However, the downstream slope would be armored to provide protection to the embankment during overtopping events. This would be the least costly alternative, but such an alternative is difficult to obtain regulatory approval if other alternatives exist (which they do).

Alternative 2 – Lower the Spillway by 2.6 feet: This alternative includes lowering the spillway and therefore the existing normal lake levels by 2.6 feet. Doing so wou provide the dam with adequate freeboard during the design storm and lessen impacts downstream.

Alternative 3 – Lower the Spillway by 2.0 feet and upsize the existing dischar pipe to a 4-foot wide by 5-foot wide culvert: This alternative includes lowering th spillway and therefore the existing normal lake levels by 2.0 feet and replacing the existing discharge pipe with a new larger culver. Similar to Alternative 2, doing so would provide the dam with adequate freeboard during the design storm and lesse impacts downstream.

Note that Alternatives 2 and 3 are viable alternatives that would satisfy VT DSP requirements. Additional modifications to the downstream slope will likely be requir to minimum factor of safety requirements for stability and seepage. We would discuss Alternative 1 with the VT DSP but are not confident that they would allow overtopping since other viable alternatives exist.

Alternatives 3A, 4A, 4B, and 5 above either do not provide the minimum freeboard and/or cause significant downstream impacts during the design storm event and ar not recommended.

In summary, unless VT DSP accepts an alternative that includes armoring the downstream slope, we will likely need to permanently lower the level of Shadow La by 2.0 to 2.6 foot, which is about its current level.

Thanks.